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PICKS and SHOVELS

By O. E. POTTER

Slow—Washout!

An unusual but none the less effective use of signs along the highway has come to our attention in an Associated Press dispatch in the *Cleveland Plain Dealer* of August 8.

It seems that up near Shell Lake, Wis., the roads were pretty dusty this summer. But motorists slowed down as, through the dust, they spied signs reading "washout" on both sides of a highway detour at the Guy Campbell farm, though as they drove on they saw no washout in the road.

Mrs. Campbell, tired of having clouds of dust soil her washing, put out the signs when she hung out the clothes.

Fire Insurance for Roads—Would Lloyds Take the Risk?

Last winter when frost and freezing damaged the roads of North Carolina extensively, many were surprised by the weather but not by the resulting need of road repair. Late in July, however, the surprising news turned up of a road being burned, according to a story in *E. F. Craven's Road Machinery News*.

W. C. McCormick, Assistant State Forester, reported that forest fires near Wenona, Washington County, burned out the foundation of the road for a stretch of nearly 2 miles. The road is constructed of a mineral topsoil placed on a bed of peat and vegetable matter. The fire that swept through the surrounding timber ignited the peat and vegetable foundation, burning it out and causing the road to cave in.

Will roads burning up be added to the list at Lloyds, along with rain on King Edward's Coronation Day, and quintuplets?

Patching With Rock Asphalt

Indiana Maintenance Crews Patch With Like Material and Produce Smooth-Riding Highways

(Photos on page 40)

MORE credit should be given to the maintenance forces of the various state highway departments for the character of the patches they make in the surfaces of roads. It is too true that in many states we would have to withhold this editorial blessing for the patches ride like frost boils. In Indiana we have experienced the satisfaction of riding hundreds of miles of highways maintained by the state and have generally found the patches most satisfactory.

(Continued on page 28)

Automatic Batching for Concrete Dam on Tygart River, W. Va.

(Photos on page 40)

THE first fully automatic batching plant on a large construction project east of the Mississippi River is being operated by the Frederick Snare Corp. of New York City at Grafton, W. Va., to produce the 1,200,000 cubic yards of concrete for the Tygart River Reservoir Dam. This PWA Project No. 44 is a combined flood control and navigation project. It was designed by and is being constructed under the direction of the Corps of Engineers, U. S. Army. To serve the concrete production plant, capable of producing a maximum of 5,000 cubic yards of concrete in 24 hours, a large organization of men and equipment has been assembled by the

Frederick Snare Corp. Has Plant for Daily Average of 4,000 Cubic Yards of Concrete

contractor so that despite delays due to excessive cold weather from November 1935 to March 1936, and the six floods of November and December 1935 and February and March 1936, construction is running neck and neck with the progress schedule. Ground was broken December 27, 1934 and the first concrete poured May 28, 1935. The contract allows 1,080 calendar days for the completion of the work, making the final date for the delivery of the finished dam, December 31, 1937.

Aggregate Delivery

Since concreting would require between 90 and 100 cars of aggregate daily to maintain the production schedule the contractor made arrangements with the New Martinsville Sand & Gravel Co. of New Martinsville, W. Va., for the delivery of Ohio River aggregates. This company is composed of five associated companies and the full production of two of these plants and part of the production of three others is required to furnish sufficient aggregates.

To provide sufficient area for the tracks necessary to store and classify the various construction materials delivered to the site by way of the Baltimore & Ohio Railroad, the contractor placed 350,000 cubic yards of excavated material from the early work in an area of 10 acres and placed thereon $5\frac{1}{2}$ miles of track, including fourteen classification tracks capable of handling 180 to 200 cars. All shifting within the yard is done by an American Locomotive Works 75-ton steam switching engine.

As construction of the dam progressed it was necessary to provide a right-of-way through the structure for the G&B Branch of the B&O Railroad. This was accomplished by leaving a tunnel of sufficient clearance at the location of one of the two power conduits provided in the dam for possible future use. The larger opening for the trains will be plugged later, leaving only the circular conduit opening as designed.

A 2,500-ton track hopper, a reinforced concrete structure 260 feet long by 21 feet wide and 27 feet deep, was built for unloading the hopper-bottom aggregate cars. It is divided into four separate hoppers for the various aggregates as follows: sand, 750 tons; 1-inch gravel, 485 tons; 2-inch gravel, 455 tons; and 4-inch gravel, 815 tons. Beneath the track hopper is a tunnel containing the aggregate belt for transport.

(Continued on page 9)



Concreting Trestle at Tygart Reservoir Dam, Grafton, W. Va.

Complete Lubrication and Fueling Provided By Special Truck on Hemstreet & Bell Jobs

"THEY kept Bill hustling so on the Cat pulling the spreader today that I had to go back three times before I could finish greasing him," reported the driver of the unique lubrication and fueling truck of Hemstreet & Bell as he pulled into the yard by the hot-mix plant near Los Molinos, Calif. He had started out with the first truck in the morning and taken each piece of equipment as it could be released for a few minutes from its allotted work to refuel with butane gas and to lubricate it from the assortment of Pennzoil lubricants carried in the various containers.

This truck is quite a complete greasing shop in itself. The contractor took an old GMC chassis and mounted on it the various containers in such a compact assembly that one is misled as to

the amount of things that it can supply. First there is a 500-gallon tank for butane gas at 150 pounds pressure mounted horizontally on the chassis. As the contractor uses butane gas in all of his equipment, the truck can refuel any truck or grader or tractor in a moment by connecting up to the tank on the equipment.

Immediately above the butane tank is a pair of horizontal tanks about 16 inches in diameter and 5 feet long. One of these contains air at 150 pounds for any flat tires that develop, and the other water for roller rolls or radiators that get thirsty.

On the same side as the air tank is a series of drums with oils and grease and containers for the grease guns.

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Divers and Sundry Jobs On Bonneville Project

By HENRY W. YOUNG

(Photo on page 40)

ON a project of the size and kind of Bonneville, the number of special problems and "emergencies" may occur so frequently as to become almost part of the routine. Aiding in the solution of many of these special problems is the diving team, O'Donnell & Vance, who are on call night and day and whose tasks are various and sundry.

The proverbial busy bee or ambitious ant might take a lesson from these divers on some of their days when the jobs pile up and they go from cutting a fouled cable under water, to putting the pins in the hinges of the cofferdam, and in general, furnishing the much needed eyes and hands at the river bottom during the sinking of the cribs or driving of steel sheet piling. And then, of course, in the pressure of work, the contractors are forever dropping little things into the river, a steam shovel, a truck or a bulldozer. And then to the rescue go the divers, lines are placed around the piece of equipment and it is fished out.

This team of divers is a partnership of C. O'Donnell and R. H. Vance, who have done diving and marine work of this and other kinds practically all over the world. Their last big job was on the San Francisco-Oakland Bay bridge, and now, at Bonneville, they are under contract by the year to the Columbia Construction Co. and the U. S. Engineers.

Their Tasks Are Many

While it is not possible to enumerate everything that they do, the following examples taken at random will serve to indicate how important their work is to the contractor:

1. Drilling and blasting under the cribs; 2. Cutting off a row of 107 steel piles to salvage them; 3. Cutting off fouled cable; 4. Putting pins in third-step cofferdam; 5. Examination of cribs in winter under ice; 6. Cleaning out guides for stoplogs in powerhouse openings; 7. Examining steel piling already driven, for openings; 8. Assisting pile driving crew; 9. Locating submerged equipment and arranging tackle for hauling it out; 10. Locating and helping raise a sunken boat.

Special Torch for This Work

In addition to the hand tools which the diver has ordinarily employed, he now has a special one which has en-



C. & E. M. Photo

The Dug Well Which Furnished Water for the S. J. Groves Job

O'Donnell & Vance, Divers, Fish for Everything from Wrenches to Power Shovels and Untangle Piles

larged the scope of his activities materially. This is the oxy-acetylene-compressed air cutting torch. On the divers' barge, there is almost always to be found a pile of cylinders with their pressure control devices all connected up and ready for use. Even if the diver is not going down to do a specific cutting job, he never knows when he may encounter steel that requires cutting. Compressed air is carried in the cylinders, as well as the two gases, as it is cleaner and drier than air that might be taken



The Divers' Barge With Its Oxygen, Hydrogen and Compressed Air Containers. Diver Vance Is Just Coming Up From Helping the Pile Drivers.

Concrete Road Paved Speedily in So. Jersey

UNDER conditions seemingly ideal. S. J. Groves & Sons, Inc., started pouring a 12-mile stretch of 2-lane concrete highway south of New Lisbon, N.J., on April 1, 1936. With the new pavement about 25 feet east of the existing road for its entire length, providing ideal hauling conditions, a good batching set-up, and a sand and gravel sub-grade that drained perfectly, a contractor's millenium seemed assured. But, "There ain't no such animal." Floods in Pittsburgh 280 miles away quite effectively stopped production of material on order for the new beam-type expansion joint used in New Jersey and then when the material did arrive, an extended period of misty weather prevented painting the parts with the two coats required by the state specifications. This delayed actual paving for several weeks, but, when old Jupiter Pluvius finally quit harassing the job, things began to click and in spite of a new organization and an 8-mile dead haul from the batching plant, the 27-E paver, which has over half a million square yards of pavement to its credit, day after day laid down 900 feet of 10-foot pavement uniformly 9 inches thick and the new dual drum paver stepped out with an average of 1,500 feet per day.

Grading

Grading on this 12-mile project was started October 12, 1935, with four 1¼-

from the general-purpose compressor lines.

The torch used by O'Donnell & Vance is a Victor submarine, fitted with a new type of hood, which was developed at Bonneville by Barten Carter of the Columbia Construction Co., and perfected there by practical tests made by the divers. The hood is so designed that when the torch is under water a constant cone of air is maintained in front of the tip. This is called the bubble. The oxy-acetylene flame then burns in this cone and the diver goes ahead with his cutting. His speed below is about 80 per cent of good cutting speed on the surface. The air pressure used is approximately one-half pound for each foot of depth. The torch is lighted on the surface, the air turned on and it is then lowered to him by a line. It will operate in any position in the water.

Some Odd Jobs

Taking up in more detail some of the activities previously mentioned, that one in connection with drilling and blasting under the timber cribs is especially interesting. As already described in the CONTRACTORS & ENGINEERS MONTHLY (June, 1936), these cribs are built with tailored bottoms to fit the contour of the river bed. But it is impossible to get them to fit exactly with soundings alone.

(Continued on page 20)



The Oxy-Acetylene Compressed Air Torch, Lighted and With the Air in the Form of a "Bubble" Being Lowered to the Diver Below in 60 Feet of Water

seems a bit unfair to the 27E paver that had already done noble service in laying down half a million cubic yards of pavement. The contractor figured that by starting his new Ransome Dual Drum paver at the north end of the 12-mile job on the west slab on April 1 and then following up with the Ransome 27E on April 18 on the east slab, also starting at the north end, that the two pavers would remain far enough apart so that there would always be sufficient concrete slab ahead for the 27E to run on the concrete and when the dual drum paver reached the end of its run, it could turn back and pave a section of the east slab before being run over to the next contract in Manasquan, N.J.

By this kind of team work the contractor was able to finish the paving before the date he had set, August 1, in spite of initial set-backs.

S. J. Groves & Sons does not leave anything to chance when it comes to putting equipment into condition so that it will give the best possible account of itself when the construction season opens. Between \$15,000 and \$20,000 was spent last winter on equipment repairs. We feel that the record of the dual drum and the 27E paver with their accessory equipment of graders and finishers proves the value of the investment.

Labor and Hours

On this Federal Aid Project 130A and B, mostly local labor was employed. The job was run five days a week and eight hours a day, giving a 40-hour week with any losses due to weather or other causes made up on Saturday. The job started at 8 o'clock in the morning and finished at 4:30 at night with one-half hour for lunch.

Running the Dual Drum Outfit

Ahead of the dual drum paver which traveled an average of 1,500 feet a day, a Warco power grader on crawlers cut the rough grade close to its final elevation and took care of the form trench. A crew of six men handled the form setting. The master formsetter ran the form ahead and then the double line of Blaw-Knox 9-inch forms with an 8-inch base were set under his direction by the six men. A total of 2,250 feet of these forms was kept moving on the job.

(Continued on page 16)

A Dual Drum and a 27E Paver Used on 12-Mile Contract by S. J. Groves of Ridgefield, N. J.

ward Lorain power shovels, and six Caterpillar Sixty gasoline tractors with LaPlant-Choate bulldozers preparing rough grade for the two 10-foot strips of 9-inch concrete pavement and the two 15-foot shoulders. The material which was sandy gravel was easily and speedily handled.

Team Work on Concreting

Starting off a new dual-drum paver with a handicap of 15 working days



C. & E. M. Photo

This Dual Drum Paver Averaged 1,500 Feet of 10-Foot Pavement 9 Inches Thick Per 8-Hour Day on the S. J. Groves 12-Mile Concrete Paving Job

\$360,000 BUYS 35 MILES OF NEW, DURABLE PAVING



Three mechanical pavers laying new Hot-mix TEXACO Asphaltic Concrete top in 35-mile resurfacing program of Evanston, Ill. Machine-spreading was used throughout the project.

Evanston, Ill., was handicapped by a large mileage of old, worn streets, most of them of waterbound macadam construction. This year, the city has transformed 35 miles of its obsolete streets into modern, durable pavements. An expenditure of \$360,000 was called for by this ambitious modernization program, representing approximately \$10,000 per mile.

Evanston's new paving is of a heavy-duty type, Hot-mix TEXACO Asphaltic Con-

crete. While the rough waterbound macadam was an unsatisfactory riding surface, it had become so firmly consolidated by traffic that it provided a splendid foundation for resilient, lasting TEXACO Asphaltic Concrete surfacing.

Other cities with waterbound macadam, or other types of paving, which have seen their best days, will benefit by following Evanston's example. Our nearest office will gladly cooperate in working out the details.



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Watch Your Burlap!

If you buy second hand burlap, particularly old burlap bags and have them sewed together to provide the strips for the initial 24-hour curing of concrete pavements, we warn you—watch your step!

Reports reached us in the west this summer that at least two contractors had set up a howl when they had to replace concrete slab, the surface of which had been ruined by the action of chemicals retained in the second hand burlap. In both cases, old bags had been used and since burlap is burlap, no inquiries were made into the history of previous service of the jute bags. Some may have carried fertilizer, organic or chemical, others may have served to transport chemicals which might prove injurious to cement, and still other bags may carry in their fabric soluble substances which would seriously retard, if not even halt, the setting of the cement.

It's as good a plan to buy new burlap as it is to buy new rather than used equipment of unknown service and dependability.

There is, however, a word of warning necessary even when new burlap is used. New burlap itself should be thoroughly washed to remove the chemicals or sizing retained in the fibers from the manufacturing process. Its sounds like working the "bugs" out of a new machine!

More Guard Rail or Wider Roads?

From Florida comes the intriguing thought that wider roads with flatter slopes are cheaper than the installation and maintenance cost of adequate guard rail on long, low fills. The pair of photographs at the bottom of the page show what the eastern "sunshine state" is doing.

While guard rails are fully as important in highway construction as an

In Many Cases, This Is Cheaper



Than This



Widening Long Fills in Florida Has Proved Less Expensive Than the Installation and Maintenance of Miles of Guard Rail

all-weather non-skid road surface for the safe operation of cars on high fills, curves and along precipitous slopes, the expense of the installation and maintenance of guard rail at all fills is not necessarily justified.

Florida has used guard rail on low fills, as have many other states, perhaps more as a matter of habit than of necessity. A study of the situation showed that wider road beds, the elimination of deep ditches and the substitution of flat slopes made for greater safety for high speed motor traffic and that the danger of serious injury or death if a car ran off the road was very small. Consequently widening operations have been undertaken and the necessity for much guard rail has been eliminated.

A wider road bed makes a safer road. This is only one of the advantages of this type of roadside improvement, which also tends to retard erosion, improves sight distances and prepares the way for future widening of the road surface, all of which further contribute to the safety of the traveling public.

The Contractor's Goats

This summer we arrived at the batching plant of a paving contractor in the middle west during the noon hour when all was quiet. As we walked over to study the batching layout a pair of young goats trotted side by side up the road ahead of us. They reached the batching plant, looked quizzically at it and then scampered off to a nearby field.

We asked the concrete foreman later if they were the contractor's goats. He replied, "Every contractor has them goats. They are named Breakdown and Heat."

The Highway Tax Bill

Highway transportation is taxed in excess of one billion dollars annually, or about five times as much as railroad transportation, according to Baird H. Markham, director of the American Petroleum Industries Committee, speaking at the Delaware Highway Users Conference in Wilmington, Dela. Gasoline taxes alone, he reported, make up 80 per cent of the highway users' tax bill. More than 9,000 bills directly affecting highway use were introduced in state legislatures in 1935 and 1,200 of them became laws.

With state legislatures hounding the motor vehicle owner with more and more taxes and then diverting these taxes from their legitimate uses for the improvement and maintenance of our highways, the motor vehicle owner has reached a position even less enviable than the allegedly rich who would be "soaked" by most legislators. Since the usual gasoline and other highway taxes are unseen, they are not noticed but the day is not far distant when another cent tax on gasoline or another dollar on licenses will be the straw that will break the taxpayer's back and then we will see a different set of legislators basking in our air-conditioned halls of law.

Accident Experience In Industry in 1935

The construction industry lowered both its accident frequency rate and accident severity rates during 1935, as compared with the 1934 rates, according to reports of the National Safety Council. These reports cover the records of 73 construction organizations whose employees worked 135,872,000 man-hours.

The average 1935 frequency rate of 28.24 (the number of disabling injuries per million man-hours of exposure) is 16 per cent below the average rate for 1934; and the corresponding severity rate of 4.52 (the number of days lost per thousand man-hours of exposure) is 8 per cent below the 1934 record.

The construction industry suffers, however, in a comparison with the average rate for all industries. In a list of 30 major industries reporting to the National Safety Council, the average frequency rate for all industries is 14.02 and the average severity rate 1.58.

Nevertheless, the frequency of disabling injuries in the construction industry has decreased notably by 58 per cent since 1926, almost equaling the average reduction of 61 per cent in all industries during the same period. Severity is down 61 per cent in construction organizations as compared with 43 per cent average for all industries.

Large organizations had by far the best record in 1935, but small organizations made the best showing in comparison with 1934 records. Of the various branches of the industry, general construction work (not building) had the lowest 1935 rates, while organizations engaged in highway work made the best showing in comparison with 1934 by reducing frequency 42 per cent and severity 65 per cent.

The most important types of compensable accidents in the construction industry, according to state reports, are handling objects and falls to a different level, which account for 52 per cent of all accidents.

Detailed information on accident rates in the construction industry is contained in a booklet of that title which may be secured from the National Safety Council, 20 North Wacker Drive, Chicago, Ill.

Five-Year Road Program Undertaken in Chile

In 1937 work will start in earnest on the five-year highway construction program in Chile, 160,000,000 pesos for which was recently voted by the Chamber of Deputies. Most of the roads to be built under this plan will be of gravel, though one short hard-surfaced road will be built out of Talca, another from Santiago to Puente Alto and two or three short stretches.

One relatively new departure for Chile which is contemplated in this highway program is the application of oil treatment to gravel surfaced roads. According to the last report on highway mileage in Chile, only 21.6 miles were of oil treatment. The excessive dust throughout the long dry season in the central zone in Chile makes travel by car very unpleasant and consequently the Department of Roads plans to introduce oil treatment as a remedy.

It is likely that some extensive purchases of road building equipment will be necessary to carry out this program, particularly of scarifiers, graders and rollers, according to a report from the U. S. Bureau of Foreign and Domestic Commerce. An expenditure up to 8 per cent of the total of the funds provided may be spent for machinery and equipment, according to the provisions of the law, which would amount to about \$500,000 U. S. currency.



Reproduced Through the Courtesy of Webster and the New York Herald Tribune
One of "Life's Darkest Moments"

Lighting Our Highways Discussed at Convention

The very pertinent subject of highway lighting took a prominent place on the program of the Thirtieth Annual Convention of the Illuminating Engineering Society at Buffalo, N. Y.

Highway lighting has become such an important subject, and differs in so many respects from the problems of street lighting, that a Code of Highway Lighting has been prepared by the Committee on Street and Highway Lighting of the Illuminating Engineering Society and was presented to the convention. This Code aims to offer the best guidance that the present state of the art affords. This report includes not only statements as to the proper planning and placing of highway lighting systems, their relation to the type of road surface and the general classification of the highway, with recommendations for solving the various problems, but also contains a summary of the relation of motor vehicle accidents to proper or inadequate highway lighting.

Another paper on this general subject was "Determination of Visibility on Lighted Highways" by Kirk M. Reid and H. J. Chanon, of the Nela Park Engineering Department, General Electric Co., Cleveland, Ohio. This paper discusses the technique of field evaluation of the seeing afforded by highway-lighting systems, and reports the measurements of visibility and related factors for three highway-lighting installations of widely dissimilar characteristics. The results show substantial differences in the seeing values.

Earl J. Reeder, Traffic Engineer, National Safety Council, discussed the problem of highway lighting, with particular reference as to its need for safety, from the point of view of the traffic engineer. The procedure which is considered necessary in determining where highway lighting is needed for accident prevention is described, and the importance of the accident-experience approach to the problem is emphasized. Methods are suggested for the determination of the criteria for the need of highway lighting for safety, and until such criteria have been established on the accident-experience basis, highway lighting will fail to attain the recognition in the traffic engineering field which it deserves, said Mr. Reeder.

Copies of these papers may be secured for 15 cents each from the Illuminating Engineering Society, 29 W. 39th St., New York City.

During the first six months of 1936, there were consumed in the United States 30,249,819 more pounds of industrial explosives than in the corresponding period of the year before, according to statistics just released by the Institute of Makers of Explosives.

Plant and Equipment for Oil-Aggregate Mix

By J. G. SCHAUB
Assistant Construction Engineer, Michigan
State Highway Department

IN an endeavor to get rural Michigan out of the dust and to provide safe and serviceable highways for the traveling public and the tourists who visit the state, insofar as funds are available, the Michigan State Highway Department has been experimenting with oil-aggregate mixtures as an economical surfacing for the many miles of gravel roads where traffic conditions are not severe. This type of surface eliminates the dust nuisance and provides smooth pavement at comparatively low cost.

Some of Michigan's experiences with this type of road construction were described in a paper presented before the Twenty-Second Annual Conference on Highway Engineering at the University of Michigan, upon which this article is based.

The Michigan State Highway Department in its specifications adopted September 1, 1934 provides for three different methods of constructing oil-aggregate surface, road-mix, traveling-plant mix, and stationary-plant mix.

During the 1935 construction season 13 1/4 miles of road-mix were laid in one project and 16 3/4 miles of stationary-plant mix in three projects, one of which was 11-1/3 miles long. About 63 miles of this type of construction was contracted for during the 1936 season, in addition to a WPA program of about 300 miles.

Foundation and Prime Coat

Oil-aggregate surface course of 3-inch compacted thickness with 1 1/2-inch crown is usually laid 20 feet wide on old or new gravel bases having a width of 21 feet. If an old gravel road is to be used as a foundation, it is reshaped and widened, if necessary, to provide 21 feet of compacted metal of satisfactory thickness. Care must be exercised to eliminate waves and irregularities with blade or maintainer, to provide a base surface reasonably true to crown and grade.

With a non-rigid surface on a gravel base, extra precautions must be taken to provide proper drainage facilities to take care of subsoil and surface water.

In the construction of a new gravel base or conditioning of an old gravel base, tests are made by the Research and Testing Division to insure, in addition to properly graded aggregate, a sufficient amount of clay or binder to produce a stabilized foundation. Calcium chloride is used to assist stabilization in dry weather.

The prepared surface is then primed with bituminous material at the rate of approximately 1/3-gallon per square yard, using cut-back asphalt, slow curing oil, emulsified asphalt or tar. Slow curing oil was used on several projects but proved less satisfactory than the cut-back asphalt or tar because its slow curing properties caused it to be picked up by traffic for a considerable time. One reason for the use of a prime coat is to seal the surface from moisture from below and any picking up or breaking of the prime coat destroys the seal.

Mineral Aggregates

The 1935 aggregate specifications applied for both road and plant mix. Mineral aggregates could be natural crushed or uncrushed sand-gravel, slag, crushed mine rock, crushed stone, stamp sand with finely divided mineral matter, supplied either separately or in combination as may be necessary to

Experimentation and Study by Michigan State Hwy Dept. Produce Economical Method of Building Low-Cost Roads

conform to the following composition limits, by weight:

Passing 3/4-inch screen.....	100	per cent
Passing 1/2-inch screen.....	60-90	per cent
Passing 10-mesh sieve.....	35-50	per cent
Passing 40-mesh sieve.....	20-40	per cent
Passing 200-mesh sieve.....	5-10	per cent
Clay or mud balls must not be more than	2	per cent

New specifications, which it is believed will fit the aggregate conditions and production methods better and also produce denser mixtures, were prepared for 1936. The material passing the 1/2-inch screen must now be 65 to 90 per cent and material passing the 10-mesh sieve, 40 to 60 per cent. Aggregates conforming to these requirements are available economically in practically all sections of Michigan.

Bituminous Materials

The oil required for this surface is a slow-curing liquid asphaltic material. For road-mix or traveling-plant mix a medium viscosity oil known as SC-3A is specified while for stationary-plant mix a high viscosity oil, SC-4A, is required.

Mixture Composition

A considerable study of the aggregates in Michigan and their behavior with various fines in oil mixture has been made. The water-asphalt preferential test indicates that some fillers have a greater affinity for water than

for the oil. This property of fillers is, we believe, more important in the water-resisting action and length of life of oil mixtures than of hot asphalt mixtures, due to the nature of the bituminous materials. Some silica fillers, fine sands and silts have a greater affinity for water, or are hydrophillic, while most calcareous fillers, such as limestone dust, marl, sugar beet lime, prefer the oil or are hydrophobic.

The use of marl for filler was an innovation. Tests showed this marl to be mostly calcium carbonate, though somewhat finer than commercial limestone dust. Allowance for this fineness was made in the surface area factor, using 300 instead of 250 as the factor for the material passing 200 mesh and consequently a little more oil.

The specifications require the amount of oil to be between 4 and 6 per cent by weight of the total mixture. The exact amount of oil required for a particular aggregate and filler is determined by the Research and Testing Division. (Continued on page 21)

3/8 and 1/2 yard machines that can "TAKE IT"



HERE is the rotating base of a Northwest Model 15, 3/8 yd. shovel, crane and dragline. Compare it with the welded bases of other machines of equal capacity. It is a solid one piece casting free from structural—sturdy, rigid, rugged—more than capable of taking the shocks of digging that it will receive.

The same design and principles of construction are standard for the rotating base on the Model 18, 1/2 yd. Northwest—and this is typical of the entire construction of Northwest Models 15 and 18. They are heavy duty throughout, and include features for output found on no other line, size for size.

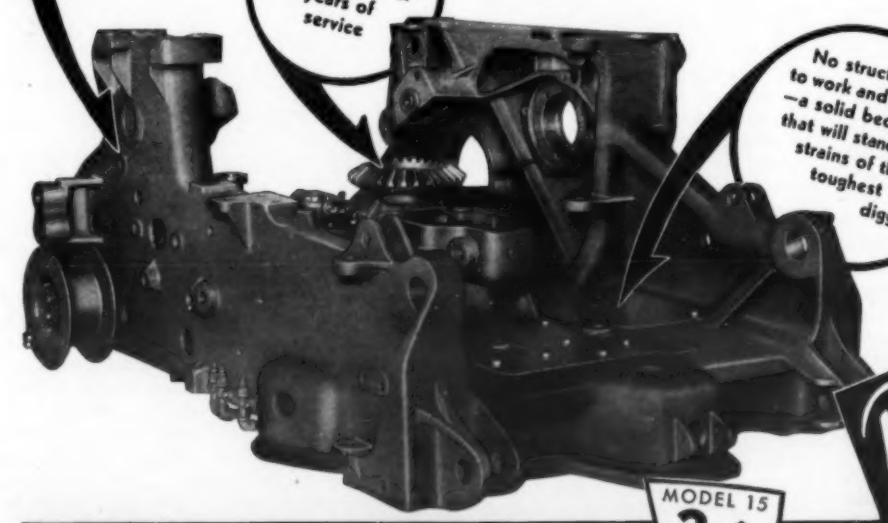
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3/8
YARD

CONVERTIBLE FROM CRAWLER TO TRUCK AND VICE VERSA

MODEL 18
1/2
YARD



C. & E. M. Photo

The Quarry Floor, Grizzly and Screen House As Seen from the Top of Keeley Construction Co.'s Quarry

Effects of Drought On Road Construction

The extended dry weather prevailing over most of the state of Indiana has been both a hindrance and a help to the extensive highway construction program. While the lack of rainfall and low stream levels has been a boon to contractors engaged in the erection of new bridges and has speeded up the laying of much new pavement, the same condition has been a handicap to contractors working on stone and gravel surfaced highways. Continued dry weather is creating a new problem for highway workers constructing grades and fills as there has been little or no moisture to speed up the settlement of the materials.

Heavy layers of dust forming on sections of highways to be surfaced with stone and gravel and at some points where paving is in progress has become a handicap that cannot be overcome until there is sufficient rainfall to moisten the ground, according to James D. Adams, Chairman, Indiana State Highway Commission. On some construction projects trouble has been experienced in maintaining a sufficient water supply but up to September 1, no projects have been stopped for this reason.

Hot-Mix Road Design

Particular stress was laid on a modification in the design of hot-mixes for stability by Bernard E. Gray, Chief Highway Engineer, The Asphalt Institute, in speaking before the North Atlantic Highway Officials Association. Some years ago when stability measuring equipment was first devised and it was learned that this characteristic could be increased by the addition of more filler, the use of harder asphalts or a combination of the two, there was started a trend toward making mixtures that now are sometimes too hard.

Pushing or shoving of asphaltic concrete and sheet asphalt pavements is practically unknown today, but there has developed instead a certain amount of cracking. Changing traffic conditions have aggravated this latter condition, due to reduced annealing effect formerly obtained with hard tires, together with freedom from oil drippings which aided in keeping a pavement in sufficiently ductile condition to resist cracking.

Present design should therefore be made upon the basis of the minimum stability required to prevent lateral displacement, and consistent therewith to use as little filler, as much asphalt and as soft an asphalt as possible. There are but few pavement situations today where a 60-70 penetration asphalt cement will not give better results than one of harder grade, and in many instances, particularly for medium traffic, it will be desirable to use even a 70-85 penetration grade.

Preparing Stone for Road-Mix Job

Contractors Roadside Quarry Had Smooth Floor for Truck Operation and Screen of Ledge to Protect Traffic

TO PROVIDE stone for the 5.8-mile Federal Aid Project 72-A on U.S. 50 east of Romney, W. Va., bid in at \$168,349.50, the Keeley Construction Co., of Clarksburg, W. Va., opened a roadside quarry 3 miles west of the town and stockpiled all stone for the surface at approximately one-mile intervals throughout the length of the job. The stone in the quarry was of three different geological formations and was so stratified that it was advisable to take out the material that would form the smaller sizes first and stockpile them before operating the crusher for the larger stone for the macadam base course.

The Quarry Setting

In order to take advantage of the strata of rock the material was drilled in depths varying from 6 to 16 feet. The individual strata ran from 6 to 10 feet thick and either one or two of these strata were drilled at one time. When these were shot the material broke clean, leaving a flat shelf that was developed into a smooth quarry floor for the 180-foot length of the quarry. The overburden ran from a maximum of 10 feet at the foot of the ledge to only 2 feet at the top.



C. & E. M. Photo

Tamping a Charge in a Deep Hole at the Top of the Quarry

The quarry face ran from 10 feet at the start to 60 feet as the quarry was worked to its full depth. A section of ledge running 20 feet above the quarry floor and 40 feet above the highway was left as a screen to protect traffic at all times even though traffic was stopped whenever there was a shot.

Drilling

An Ingersoll-Rand 250-foot portable compressor furnished air for the two I-R jackhammers as well as for the blacksmith shop where there were an I-R oil-fired forge and a pneumatic sharpener. Crusca drill steel in lengths up to 16 feet was used in the jackhammers, with 6 and 12-foot lengths predominating. The contractor used 40



Scrapers and a Rooter Working on a Steep Section of the North Approach Highway to the Golden Gate Bridge

Bridge Approach Stiff Grading Job

ONE of the many contracts involved in the preparation for the opening of the Golden Gate Bridge in California to traffic is the grading and surfacing of the North Approach. The purpose of this project, which involves 1,750,000 cubic yards of excavation, mostly red decomposed rock, is to provide a four-lane traffic artery connecting the end of the bridge with the state highway at Waldo Point. The length of the new approach is 3½ miles, including a 1,000-foot tunnel, which is being built on another contract. Both contracts are to be completed in May, 1937.

The irregular hilly topography of the area makes an unusually stiff job of grading. Establishing a 6 per cent finished grade on one early section of the project required a cut of 100 feet and a fill of 40 feet, with down grades for the loaded earth-moving equipment at the start as steep as 46 per cent and up-grades for the return up to 31 per cent.

Equipment Used

The Macco Construction Co., of Clearwater, Calif., contractor for this project, moved onto the job two Northwest shovels, five trucks, one Allis-Chalmers Model L tractor with Hutchins bulldozer, and eight 14-yard Type J special

Steep Grades on Macco Constr. Co.'s 1,750,000-Yard Contract for North Approach to Golden Gate Bridge Conquered by Scrapers

Carryall scrapers, three 12-yard Type J Carryalls, one 12-yard Type B Carryall, one 24-yard Carryall, two Angle-dozer, one bulldozer, one rooter and two sheepsfoot rollers, all Le Tourneau equipment and operated by Le Tourneau power control units. Carryalls working in tandem employ four-drum power units. This equipment is powered by Caterpillar RD8's and Seventy-Fives.

The tandems consists of one 12-yard and one 14-yard scraper. During a time study period these were loaded on 10 to 35 per cent down grades in an average of 140 feet by dropping the bowl of the lead scraper to loading position as soon as the trailing scraper was half full.

Loaded, both singles and tandem units came down grade in fourth gear, except 40 per cent and steeper grades, which were negotiated in third. Returning empty, the singles made the 31 per cent up grade in first and second, and the

and 60 per cent Austin dynamite for blasting, firing with an electric blasting machine located around the brow of the hill in which the ledge was located.

Rock Production

Two motor trucks with five men and a driver for each handled the stone by hand loading and hauling over the smooth quarry floor to the chute feeding the Western No. 1600 jaw crusher. The stone too large to handle readily was hand sledged. The chute was located about 20 feet above road level, giving easy gravity feed. One man at the top of the chute spotted and dumped the trucks while two men at the crusher fed the material.

Power for the crusher was provided by a Waukesha 60-hp gas engine while the bucket elevator and cylinder screen were run by an engine removed from an old Caterpillar Thirty tractor. The crusher itself was part of a portable outfit and had been removed from the truck and set up on a concrete foundation for this job.

The screen removed three sizes of stone; ¼, ¾, and 1½-inch, with the oversize delivered to a metal chute leading to a Good Roads roll crusher set to produce 1½-inch stone. The material reduced by the roll crusher was delivered to the bucket elevator again for screening. The 75-ton wood bins were not used for storage but merely to care for the material as produced and for quick loading of the trucks.

Working two 6-hour shifts, the quarry produced an average of 260 tons of stone per day, according to the weigh sheet of the state inspector. This did not include the dust or chips used to fill the voids in the macadam base, nor the tailings, 1½ to 2½-inch stone, hauled for filling soft spots in the grade. From 20 to 24 loads of 2½ yards each of the chips were hauled out each day. A fleet of three to five hired trucks hauled the stone for the road mix to the stockpiles along the right-of-way. When it came time to use this material on the road, it was reloaded to the trucks by a Barber-Greene loader with spiral feeders.

Job Data

There was a total of 120,000 cubic yards of excavation on this job for the full length of the contract which was graded 30 feet wide. A stone base of macadam and then a 180-pound road-mix surface was placed on the grade for a width of 20 feet.

Personnel

For the Keeley Construction Co., contractor for this project, G. R. "Pat" Gay was Superintendent with O. L. Buckelew as Quarry Foreman. O. R. Nuzum was Inspector in charge for the State Road Commission of West Virginia, for which Mortimer W. Smith is Chief Engineer.

17 to 20 per cent climb in fourth. Tandems made the 31 per cent grade in first, the 17 to 20 per cent grade in second and third. The hauls ran from 1,300 to 1,800 feet round trip.

The contractor works two 8-hour shifts, under the supervision of Ben Wells, Superintendent. H. S. "Pop" Payson is Resident Engineer for the California Division of Highways.



A 34-Yard Koehring Shovel, Equipped With a Special 3-Yard Snow Dipper Clearing Snow from a Milwaukee County Highway Last Winter

New Underpass On Indian Land

Federal Land Highway Job
Near Acoma Pueblo on U.S.
Route 66 in New Mexico

A NEW underpass for U. S. 66 near Grants, N. M., under the Santa Fe Railroad was completed this past summer by L. R. Allison of Albuquerque, N. M. The work was financed entirely by the Federal government with the State of New Mexico furnishing only the engineering service. This was brought about by the fact that it was a Works Program Project and also a Federal Land Highway Project bearing numbers WPGH 74 and FLHP 2C respectively, the latter because it is within the Acoma Indian Reservation.

The new underpass, replacing an older one which required two right-angle turns for relatively fast moving traffic with both corners blind, has a clear roadway of 24 feet inside of the curbs and 26 feet 2 inches between abutments, a clear height of 15 feet 7 7/8 inches and a skew of 50 degrees. To permit the construction of the new underpass at a point on the main track of the Santa Fe it was necessary to construct a trestle 500 feet long as a shoo-fly around the work. This was done by the railroad using creosoted piles, but unfortunately the line of the new wing walls was slightly encroached by the railroad and slight changes in several of the bents were necessary to permit completion of the walls. This shoo-fly carried the double track of the railroad at this point by telescoping them, making only one switch necessary to care for the old main line eastbound which



C. & E. M. Photo
Concreting Plant for Underpass As Seen
From the Shoo-Fly Trestle

was used by the contractor as a siding for materials. It was possible to spot one sand and one gravel car on this short siding and by using side-dump cars the materials could be delivered to a platform close to the track. When materials became spread out a Caterpillar Thirty-Five tractor with a La-Plant-Choate bulldozer pushed them up into a pile for easier loading by hand into the Lansing rubber-tired wheelbarrows. There were three of these easily wheeled barrows for stone and two for sand.

Abutment Forms and Concreting

The two abutments had spread footings with no piles because of the satisfactory character of the ground at this site, a real hardpan. The footings varied from 4 feet 3 1/2 inches to 14 feet wide and were slightly over 143 feet long. The abutments were 20 feet high from the bottom of the footing to the bridge seat.

The forms were built up of 6-inch shiplap lumber with 2 x 4-inch vertical furring and 4 x 4-inch wales. They were lined with 5-ply wood and the in-

dividual panels of plywood were used as many as seven times before they were discarded. The reinforcing consisted of 1-inch square and 1/2-inch deformed round bars and the forms were tied with No. 9 wire ties twisted on the outside with Bagetti twist.

The labor organization handling the concreting as well as the form work consisted of five carpenters who also handled the steel, five men on the aggregate, one man on cement, one mixer man for the Koehring 2-bag mixer used on the abutment walls and the 1-bag Jaeger used for the footings, four men on the Omaha Trailer & Equipment Co. concrete buggies, (one man per buggy,) three men puddling and the Superintendent.

A heavy falsework of 8 x 8-inch timbers was erected for the steel and used first to support the runway for the concrete buggies. For the lower sections of the forms the concrete was chuted a distance of 40 feet while for the upper section it was wheeled and dumped directly into the forms. The largest pour was 120 yards in 11 1/2 hours. A Jaeger 2-inch centrifugal pump provided mixing water from a nearby irrigation ditch on the Acoma Reservation.

Quantities

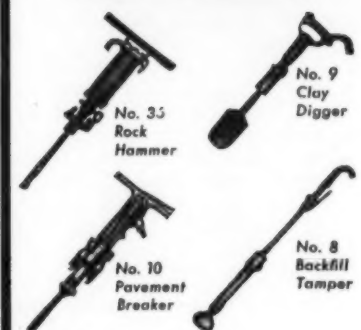
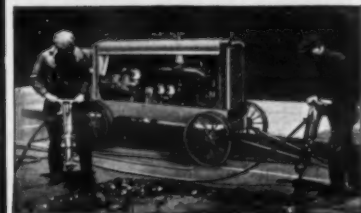
The major quantities were:

Item	Quantity
Excavation, unclassified	5,755 cubic yards
Excavation, pipe culvert	20 cubic yards
Overhaul	5,621 station yards
Class B concrete for metal pipe culvert headwalls	4 cubic yards
24-inch corrugated metal culvert pipe	162 linear feet
Railroad structure 3,000-pound concrete	413 cubic yards
Railroad structure 2,500-pound concrete	219.9 cubic yards
Reinforcing steel	35,261 pounds
Structural steel	145,244 pounds
Membrane waterproofing	207 square yards
Asphalt plank	165 square yards
Concrete curbing	34 cubic yards
Waterproofing concrete	564 square yards

Personnel

This structure was constructed by L. R. Allison, contractor, of Albuquerque, N. M., with H. C. Jones as Superintendent.

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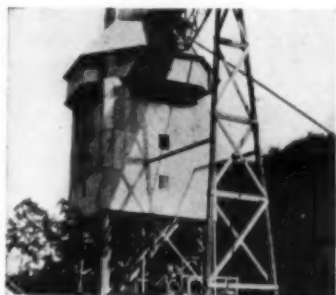
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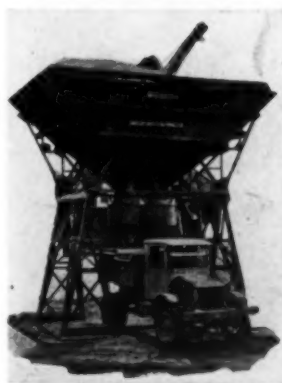
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Single Material Batcher



Bantam Weigh Batcher

JOHNSON



Grand Coulee Dam—2 Plants

The C. S. Johnson Company has furnished auto-weigh batchers and mixing plants for all large projects such as Boulder, Bonneville, Madden, Norris, Tygart, Guntersville, Hetch Hetchy, Pickwick Landing, Dover, and Grand Coulee Dams. We also build cement batching plants, cement Kone Karts, wheelbarrow scales, bantam weigh batchers, single and multiple aggregate batchers and truck charging and central mixing plants.

The C. S. Johnson Company
Champaign, Illinois



Boulder Dam—2 Plants



Auto-Weigh Batchers



Little Titan Wheelbarrow Scale



Multiple Material Batcher

Sinking Highway Saved By Piles

Beam Strength of Slab Used Effectively in N. C. to Save Concrete Road Over Marshy Ground

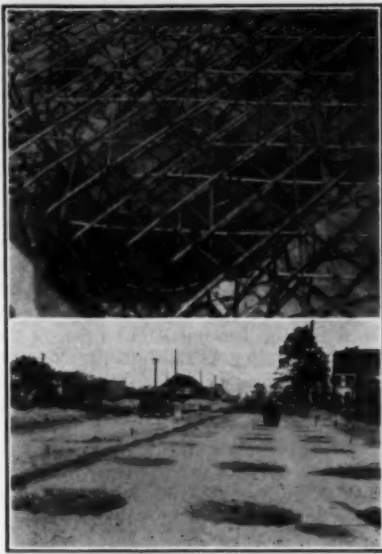
A CONCRETE road built over a log mat on marshy ground between Hertford and Elizabeth City, N.C., settled for several feet due to the unstable foundation and the vibration of traffic. After fill had been placed on the pavement and short piles used beneath it without success in checking the sinking, the North Carolina State Highway Department resorted to long piles driven through holes in the pavement and with well-reinforced caps.

In the low, flat, tide water section of eastern North Carolina the soil near streams and bays is sometimes so marshy that roads built upon it sink from sight. The first installation as a concrete slab resting on piling was on State Route 342. The pavement had sunk as much as 4 feet. Borings were made to determine the nature of the foundation which showed a soil profile of: peat, 24 feet; quicksand, 13 feet; soft marl, 3 feet; quicksand, 10 feet; and soft blue marl, 11 feet. To meet this condition, long piling driven to firm bearing was needed. The design adopted is distinctive in that the beam, monolithic with the pavement, extends along the center joint and transverse joints, with a conical cap for the piling. The outside edge has an integral curb.

Method of Construction

After the piles are driven the subgrade is brought to the proper level, cone-shaped holes are made around the piling with a metal form as shown. Reinforcement is then put in position. The piling cap is then placed monolithic with the slab. Concrete for a whole panel is placed in a continuous operation and is mixed, spread, and finished as for an ordinary concrete pavement.

The first installation at Hertford Causeway was so successful that a second section, recently completed, was designed for a bridge approach in Elizabeth City. The total cost of the 1,128 feet of supported 8-inch 18-foot slab on



Above, Reinforcing with Hole and Piling Underneath. Below, Holes Around Piling Ready for Concrete.

the first job was \$17,630, or \$7.81 per square yard of pavement. The entire project was completed in 67 working days.

Viscosity of New Oils Uniform, Hot and Cold

Contractors must operate their equipment during a wide range of air temperatures which means that the lubricants have a tendency to thin or thicken in heat or cold. The Standard Oil Co. of New Jersey, through Esso Marketers, has announced a series of special Univis oils with a viscosity index of 150 which is one-third higher than that of conventional oils.

Univis oils are 100 per cent petroleum products with no chemicals added. Their ability to maintain a more uniform viscosity eliminates the necessity of using oils of two or three viscosities during the year to meet atmospheric temperature changes. This characteristic makes them particularly suited for use

in hydraulic control apparatus such as graders, scrapers, and hydraulic dumps, where ordinary oils thicken in cold weather, giving sluggish operation, or thin out in hot weather, resulting in leakage and loss of efficiency.

These oils are not recommended for equipment operating in practically constant temperatures throughout the year as the high viscosity index is not required. These oils are available in 1 and 5-gallon cans and larger quantities and may be had in any viscosities above 100 Saybolt seconds at 100 degrees F. Technical data, samples and prices may be secured from the Sales Engineering Division, Esso Marketers, 26 Broadway, New York City.

A tunnel is now being dug under the railroad on the route to the Pyramids in Egypt to eliminate a grade crossing. The cost will be about 40,000 pounds Egyptian and will be completed about January 1, 1937, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

KOEHRING



Two, of a fleet of Koehring Cranes and Draglines, at work on a Mississippi River dam construction project.



Seconds saved with every hoist and swing—more material handled in shorter time—Swing and hoisting time is reduced to a minimum with high speed Koehring Cranes and Draglines. Save where it counts — where saving means profits.

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JAEGER

Tygart Dam

(Continued from page 1)

ing the materials to the bins at the concrete mixing plant. There are four gates in the tunnel for handling the large aggregate, two each for the smaller aggregate and three for the sand. The track hopper is housed in a galvanized iron shed to protect the materials from the weather and to permit heating in winter.

Tracks reserved for aggregate car storage will take care of 158 cars and in addition a 30,000-ton emergency stockpile is maintained to minimize the possibility of shut-down caused by delays in the delivery of aggregates.

A 30-inch Goodyear belt running on Jeffrey idlers in the aggregate tunnel and measuring 405 feet between pulley centers carries the aggregates out of the tunnel and up an adit a distance of 168 feet to a transfer point. The second belt of the same size and make is on a 15-degree slope and carries the aggregate a distance of 196 feet to the batcher bins. Both of these aggregate belts are driven by 50-hp Westinghouse electric motors. The conveyors are covered for the entire distance after leaving the tunnel adit with semi-circular corrugated iron covers to prevent material bouncing from the belt and for protection from the weather. The aggregate conveyors have a capacity of 550 tons per hour at a speed of 450 fpm.

One man in the aggregate tunnel operates the gates under the various aggregate hoppers in response to buzz and light signals from the man at the top of the batcher bins. On top of the bins the conveyor delivers to a swivel chute by means of which the various aggregates are delivered to the proper section of the Johnson Octobin. There are four aggregate bins around a square cement bin of 750 barrels capacity. The aggregate bins have capacities of 303 tons for sand, 296 tons for 1-inch stone, 279 tons for 2-inch stone and 267 for 4-inch stone, and occupy 38 feet of the height of the 70-foot central mixing plant structure. The batching equipment requires 8 feet 7 inches, the delivery chute and mixers 20 feet 6½ inches and the concrete hopper and conveyor boot about 11 feet, most of which is below the ground level.

Cement Delivery

Cement for this project is furnished by the Government from the manufacturers of three cements, Alpha, Bessemer and Medusa. It is all delivered in special bulk cement freight cars equipped with four gates for unloading through

canvas chutes to twin cement conveyor tanks installed under the tracks. There are two cement unloading installations furnished by E. Gwynn Robinson of New York City, each capable of handling one car of cement. The Robinson air activated cement conveyors are used for delivering the cement from the cars to the two 3,000-barrel cement silos. Either of the cement conveyors is arranged to unload cement direct to the mixer plant cement bin or to its own silo. The specifications permit storage of the cement in the silos for not more than 90 days so it is necessary to move the cement from the silos to the mixer plant bin at reasonable periods. This is done by means of canvas chutes from the conical bottom of the silo delivering the cement back to the Robinson conveyor tanks which are installed directly underneath the silos. An air pressure of 40 pounds is used for the operation of the cement conveyor system.

The compressor installation which furnishes air for the cement conveyor and for all other uses on the job is quite



C. & E. M. Photo
Train of Concrete Buckets Showing the "Ears" Which Speed Up Spotting the Buckets on the Cars

complete and makes use of three different types of power; steam, electricity and diesel engines. A battery of nine boilers with a total capacity of 1,100 bhp also furnishes steam for heating and curing concrete in winter and for the operation of duplex steam pumps and

siphons. Coal is very cheap in the vicinity of Grafton so the production of steam at 85 pounds pressure for the services mentioned and for the operation of five Ingersoll-Rand FRI steam compressors of 300-cfm capacity each is a measure of economy. This compressor house is located at track level adjacent to the yard.

Two other compressor houses are located at higher elevations as the power used permits that location. One I-R Imperial Type 10 compressor with a capacity of 1,050 cfm is driven by a General Electric 150-hp synchronous motor. Adjacent to this and virtually under the same roof is a battery of diesel-driven compressors. There are three 600-cfm Type POV2 and two 350-cfm Type POC units, driven by I-R diesels. Air is uniformly delivered to the mains at 100 pounds pressure.

Full Automatic Batching

One man with complete automatic batching equipment is able to turn out the 3-yard batches of mixed concrete

(Continued on page 26)

This GRAVEL PLANT



is a 1936 MODEL

● In 1936, while most aggregate markets were over-produced, the Pioneer Fuel & Brick Co. of Butte, Montana, built a new gravel plant at Finlen, Mont. This completely modern plant was designed by TelSmith engineers to meet today's conditions. Each piece of TelSmith-built machinery is properly co-ordinated and balanced. The plant runs smoothly, efficiently and profitably.

Excavated material is delivered into the plant receiving hopper, equipped with a 16'x5' TelSmith Plate Feeder, and evenly discharged to an 18'x66' conveyor which takes it up to a 3x6' TelSmith Double Deck Pulsator, used as a scalping screen. The screen's upper deck rejects the larger boulders to a TelSmith 8-B Primary Breaker; second deck rejects intermediate size to a TelSmith No. 32-B Reduction Crusher. All crushed material is returned to scalping screen for re-sizing before going to washing plant. Undersize passing the screen's lower deck goes to an 18'x123' TelSmith Belt Conveyor which discharges to a wash box. Water is added and raw material flumed to a 40'x14' TelSmith Ajax Rotary Washing Screen with blank and perforated washing sections, sand jacket, and gravel screening sections. Sand and water pass through the sand jacket and into a No. 5 TelSmith Sand Tank which separates coarse sand; overflow to a TelSmith No. 6 Sand Tank where fine sand is deposited. Each size of sand is discharged to a separate bin. Gravel is scrubbed, rinsed, sized and chuted to two separate bins. All storage bins are equipped with TelSmith Bin Gates.

Whether you are modernizing or planning a new gravel plant, write for Bulletin G-34 describing TelSmith engineering and equipment service.

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G-2

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BUCKETS**



The New Willett Speed Snow Plow

A New Line of Snow Plows Both V-Type and Blade

A complete line of new models of speed snow plows, including V-type and one-way blade plows interchangeable on the same mounting attachments has been announced by the Willett Mfg. Corp., Plymouth, Ind. They are hydraulically operated and made for trucks from 1½ to 10-ton capacity. Included in the line are reversible trip blade plows, and hydraulic operated wings for installation on heavy-duty trucks that may be used independently of or in conjunction with the heavy-duty speed plows. There are also full hydraulic tractor snow plows.

The light plows are available for operation with a hand pump in the truck cab or may be operated by a Willett electric hydraulic pump unit that operates off the truck battery. For the heavier plows and wings, operation is provided by means of a roller bearing continuous running oil pump with a power take-off operated from the truck transmission. The V-type and blade plows are built with specially curved moldboards to facilitate the removal of snow. Literature and complete data will be furnished on request and some territory is still available to distributors and dealers.

Machine Fills Joints, Marks Center Lines

You can fill a center joint, mark an asphaltic line and sand the line in one operation with the No. 91 machine announced by Littleford Brothers, 485 E. Pearl St., Cincinnati, Ohio. The asphalt tank holds 20 gallons and is fitted with a screen over the outlet to prevent clogging. Hot asphalt is poured into the tank and a gasoline heater circulates heat around the tank within a furnace shell. The tight-fitting cover has a vent.

A second gasoline burner heats the outlet valve and keeps all pipe connections warm, preventing freezing of the material. The material is hot when it is applied to the joint and therefore it penetrates to the bottom. The line

marking equipment will handle any line from 2 to 8 inches wide. It is easily detached and the machine used for joint filling only.

The control handle operates like the handle on a motorcycle and the outlet handle on the quick-acting valve is regulated from this control handle.

Diesel Road Oilers Used By Calif. Contractor

One of the first diesel-powered road oilers on the Pacific Coast is operated by Cal Cook of Road Mix, Inc., Los Angeles, Calif. The road oiler is a four-wheel chassis carrying two mixing tanks on either end of the frame, crosswise to the road and is capable of handling oil or cut-back asphalt for shoulder work. Power for the oil is supplied by a 6-cylinder Cummins diesel engine equipped as a power unit. The entire unit is pulled by a Caterpillar tractor.

The Cummins engine has a 4⅞-inch bore and 6-inch stroke and develops in



The Road-Oil Mixer for Shoulder Work, Owned by Road Mix, Inc.

excess of 125 hp at 1,800 rpm. Starting is by a 24-volt electric system, and requires neither glow plugs or gasoline for instant starting. The engine is equipped with a Twin Disc clutch, and a radiator. The power unit is mounted over the mixing tanks which are chain driven by the engine. Four gallons of fuel oil per hour are required for rotating the mixing drums.

The entire unit, consisting of tractor, road oiler and tank truck, lays 2½ miles of shoulder per 8-hour day. About 600 barrels of road oil are put through the mixer in an 8-hour shift.

Because of the low fuel and upkeep costs of the diesel engine, Cal Cook reports that the gasoline tractor now used will be replaced with a diesel tractor in the near future.



Bird's-eye View of Angledozer* Working—Note the simplicity of the Le Tourneau method of angling the blade, also how close the blade is to the tractor nose.

LETOURNEAU ANGLEDZERS* and BULLDOZERS BUILT TO DIG

Fishes' Champion—This Le Tourneau Bulldozer raced the rising Columbia River, saved the fishways at Bonneville Dam, Oregon.



More than dirt pushers are Le Tourneau Angledozer* and Bulldozers. Their correctly-designed bowls and extremely fast action enable them to dig and move yardages once thought impossible with such equipment. Their stout are welded construction stands up to punishing conditions, enables them to work day in and day out with a minimum of lost time, delivering big yardages profitably.

Fast because cable controlled through Le Tourneau Power Control Units . . . stout because of rugged design and construction . . . big capacity because of their speedy cable control and job-proved digging design.

Ask your Caterpillar tractor dealer to show you what Le Tourneau Angledozer* and Bulldozers can do for you.

R. G. Le Tourneau, Inc.

PEORIA, ILLINOIS

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Cable Address: "BOBLETORNO"

Manufacturers of:

ANGLEDZERS*, BUGGIES*, BULLDOZERS, CARRY-ALL* SCRAPERS, CRANES, DRAG SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SEMI-TRAILERS.

*Name registered U. S. Patent Office.

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**THE STRONGEST
GEARED
POWER
FOR ITS
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ALL STEEL HAND HOIST

SEATTLE, U.S.A.

COMPACT—POWERFUL—SAFE
"For use where power is not practical or available"

Manufactured in 2, 5 and 15-Ton Sizes.
For capacity comparison, ½" cable used:

2-Ton "Lightweight"	75 ft.
5-Ton "General Utility"	250 ft.
15-Ton Triple-Geared "Special"	1200 ft.

Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratio	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	\$50
5-Ton 4 & 24 to 1	110 lb.	\$75
15-Ton 4, 19 & 109 to 1	480 lb.	\$200

BEEBE BROS.

2724 6th Ave., So., SEATTLE, WASH.
Warehouse stocks for dealers' supply: Seattle—Chicago—Brooklyn—Houston. Complete Literature and List of Dealers in Principal U. S. Cities and Foreign Countries Gladly Mailed.

Wood Hoists and Bodies Shipped to South Africa

Sixty Gar Wood hydraulic hoist and steel dump body assemblies have recently been shipped to South Africa by Gar Wood Industries, Detroit, Mich., for use by the South African Government. Arrangements for the shipment was made by Walter Coxon, Director of Cape Motors, Ltd., Cape Town, South Africa, when he visited the Gar Wood plant on his return journey to South

Africa from England. Cape Motors, Ltd., is one of the largest distributing and selling organizations in Africa.

Copies of Recommendation R4-36 on Asphalt Available

The Division of Simplified Practice of the National Bureau of Standards has announced that Simplified Practice Recommendation R4-36, Asphalt, is now available in printed form. This Recommendation, which originally became ef-

fective January 1, 1924, covers penetration limits of asphalt for sheet asphalt, asphaltic concrete, construction of asphalt macadam pavement; surface treatment; joint filler, and the preparation of joint filler for various types of construction. The revision covers certain changes in the penetration limits to meet current needs and changes in construction practice.

Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., for five cents each.

Higgins New FWD Adv. Mgr.

Francis M. Higgins, market research analyst for the Four Wheel Drive Auto Co., Clintonville, Wis., has been appointed manager of advertising to succeed W. M. Hanson, resigned. Higgins, who has been with the company since 1926, has filled various capacities in the sales and advertising departments. He is the author of a digest of road laws and highway truck regulations published by his company in 1934, which won national recognition.

4,000,000 YARDS

**of Concrete
Have Been Pumped
with the
Rex Pumpcrete
by These Contractors**

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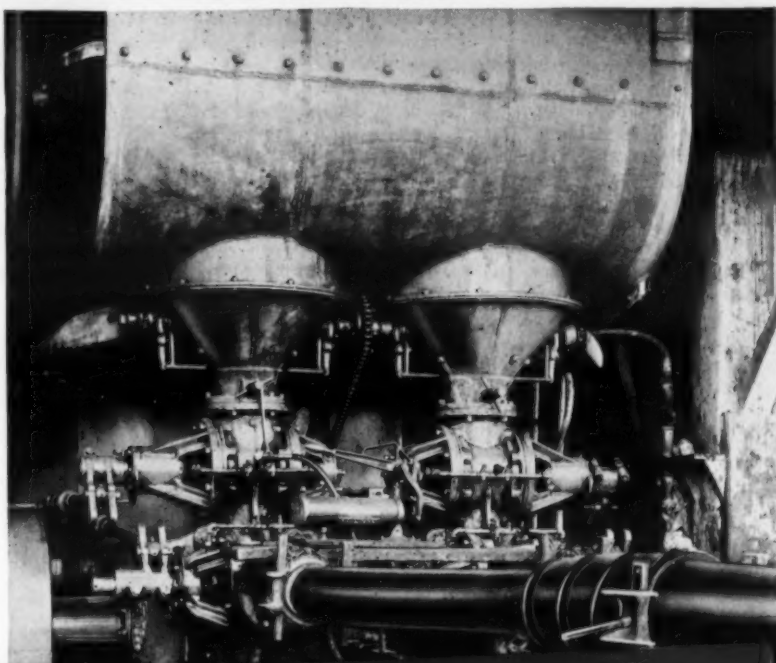
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CHAIN BELT COMPANY, 1666 W. Bruce St., Milwaukee, Wis.

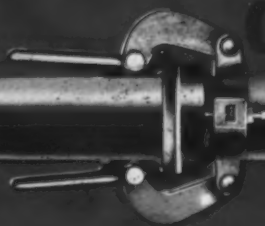
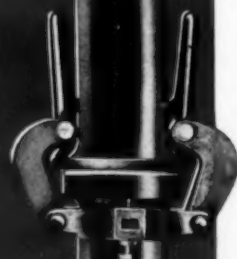
**Before You Bid Your Next Concrete Job, Do As
They Did—Look for the New Low-Cost Way**

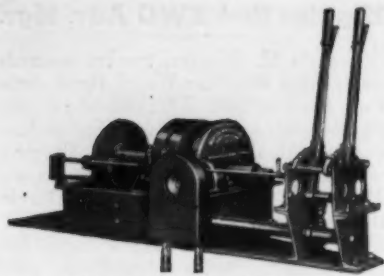
CONCRETE by PIPE LINE

REX PUMPCRETE



*They Forgot the Old Stuff for
the NEW LOW-COST WAY*





The Ramsey Truck Hoist

A Motor Truck Hoist With Friction Drum

A truck hoist with a powerful friction drum for mounting immediately behind the driver's seat and operated through levers banked on the left side of the truck has been announced by the Ramsey Machinery Co., 1626 N. W. Thurman St., Portland, Ore.

This Ramsey all-steel power hoist is compact and meets the requirements of mobile service for contractors. The clutch requires very little pressure on the operating lever and the unit will transmit its rated single line capacity of 4,000 pounds with the drum full of cable. The gears are fully enclosed in a grease tight housing and double brakes are available. It is operated through a power take-off from the truck transmission.

Small Centrifugal Pumps Announced by Worthington

Utilizing a pressed steel frame combined with quantity production and simplicity of design has resulted in a new small low-cost centrifugal pump announced by Worthington Pump & Machinery Corp., Harrison, N.J. This low-cost unit has fewer wearing parts and low maintenance costs. The pumps are furnished with direct motor drives or with pulleys for belt drive. The motor sizes range from 1/3 to 3 hp, delivering from 10 to 130 gallons per minute with heads from 10 to 100 feet.

The shaft is supported by two ball bearings enclosed in a dirt-proof and moisture-proof housing. The suction head is easily removable for inspection of the pump's interior. A choice of standard, all-iron, and all-bronze fittings is offered. Bulletin W-310-B5 shows cross-sectional views and details of construction.

HANDLE CONCRETE AND AGGREGATES
the *ECONOMICAL* way

with the Flexibility · Adaptability and Economy of the Porta Model "347"

In handling concrete from mixers to forms, and all sorts of aggregates to bins, etc. with belt conveyors.

The Porta Model "347" is designed so that it can be mounted on elevating wheel truck, or on wheels or casters and also installed on stationary supports. Made up of independent sections the equipment may be readily disassembled and stored and used on different jobs in whatever form is most suitable for the changed requirements. This flexibility assures the same low handling costs on small as well as large jobs.



Our Sales Engineers are always at your disposal. Please don't hesitate to call on us.

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PORTABLE MACHINERY CO.

Division of A. B. Farquhar Co., Limited
BOX C-1, YORK, PA.

Grade and Haul Data for Earth Moving

A new slide rule for determining time cycles and the hourly yardage moved by Carryall scrapers over widely varying grades and distances with different tractor gear combinations has been prepared by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif.

With this slide rule one may determine the maximum grade over which twelve combinations of tractor and hauling unit will travel, together with the highest gear it is possible to use. It also tells how long a tractor will take to travel in definite distances under fixed gear combinations as well as fixed times for certain Carryall operations such as loading, dumping and turning.

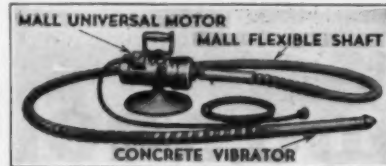
A. I. S. C. Convention

The American Institute of Steel Construction, New York City, will hold its Fourteenth Annual Convention at The Greenbrier, White Sulphur Springs, W.

Va., on October 21-23, 1936. This organization, with its 200 members, represents every state in the Union and accounts for 85 per cent of the industry

fabricating structural shapes into buildings, bridges and other steel structures. Clyde G. Conley, Mt. Vernon Bridge Co., Mt. Vernon, Ohio, is President.

You can SAVE on concrete placing costs with MALL VIBRATORS



MALL Universal Concrete Vibrator. Delivers 9000 vibration frequencies per minute. Easily carried and operated by ONE man. The price is unusually low for such a powerful and efficient unit.

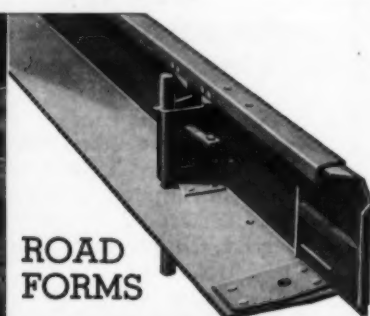
There is a type and size for every concrete structure—gas engine, air, or electrically operated units—units that will deliver vibration frequencies varying from 3450 to 9000 per minute.

Write for bulletins describing the various models.

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Equips the Road Builder

Here is equipment, trouble-free and speedy—made to reduce construction costs. It has been tried and proved on many jobs. Blaw-Knox is ready with this complete line of thoroughly modernized construction equipment—new developments ready to do jobs faster, cheaper and better—tuned to today's construction methods.

Buy new, buy now—insure your profits.

BLAW-KNOX COMPANY
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Offices and Representatives in Principal Cities



ROAD FINISHERS



DIRTMOVERS



STEEL STREET FORMS



BATCHERPLANTS

New York Sewer Built Speedily in Open Cut

(Photos on page 40)

NEW YORK is probably the champion municipal subway builder of the world with 162 linear miles of subway used by street cars, elevated trains and conventional subway trains. Special types of construction suited to the varied soils and rock of the city have been developed for both open cut and tunnel operations. These methods have naturally been transferred to other similar types of construction. When Rodgers & Hagerty, Inc., started on Contract 12 of the Bronx Intercepting Sewer near the Bronx Terminal Market, it was decided to use open cut for the 10-foot by 7-foot 6-inch sewer in soft ground, and typical subway excavation methods were used. The contractor worked two 5-hour shifts.

Work was started March 30, 1936, ripping up the asphalt and cobble pavement with Ingersoll-Rand pavement breakers supplied with air by two 310-cfm I-R portable compressors. Then small exploratory holes 2 feet square were dug to uncover subsurface structures such as gas and water lines and electric cables.

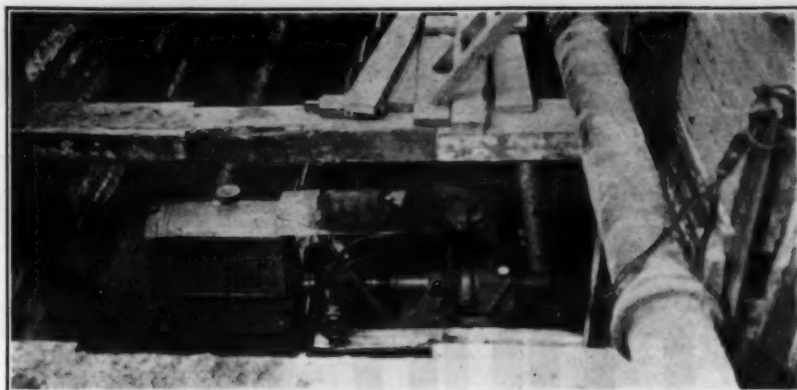
Along the stretch near the Bronx Terminal Market where the excavation was about 12 feet wide, 12 x 10-inch, 50-pound H-beams 50 feet long were driven as soldiers by a Marion 32 steam crane converted into a pile driver, using a No. 2 Vulcan steam hammer. The Marion steam crane carried 60-foot steel leads swung from the end of the boom. The boom pin was taken out and replaced with a longer pin to support the steel leads.

The contractor built a new rolling pile driver to drive wooden piles for the foundation for the sewer in soft ground. This machine moved along the top of the trench on steel rollers and has 40-foot wooden leads in which run 40-foot telescopic steel inner leads which slide through the head as well as the foot of the wooden leads, thus making it possible to drive 70-foot piles and follow them down 35 feet below street level. The steel section of the extension lead was built on the job, using a Westinghouse electric welder, and was construct-

Rodgers & Hagerty, Inc. Used Subway Methods In Construction of New Bronx Interceptor

ed with an 8-inch channel running on the 6-inch channels of the main leader, the 8-inch channels being crossbraced with 4-inch channels and with 2 x 2 x 1/4 angles.

The contractor had 4,000 feet of open cut in this section and maintained about 400 feet actually open at a time for excavation and pouring the sewer. Excavation was handled with Williams and Owen 1 1/4-yard clamshell buckets and Lima 101 gas-engine-powered cranes.



C. & E.M. Photo

A Wellpoint Pump Installation on Contract 12

The soldiers were driven on 10-foot centers and 12 feet face to face across the trench. A 20-inch high-pressure water pipe below the surface caused some trouble at one point and was carried on the 12 x 12-inch braces which rest on angles welded to the soldiers. The excavation was in blue clay for the

first 12 feet, and then underlying coarse sand with a strata of clay of varying depth that was mean to handle.

As the trench was excavated, 3 x 12-inch horizontal sheeting was placed behind the outer flange of the H-beam down to the wellpoint header located at

(Continued on page 35)

25
JOBS

Show the ³/₄ Yard
Lorain-40 Averages

85 YDS.
PER HR.

★ A survey of 25 L-40 jobs—18 shovels and 7 draglines, spread from Texas to Minnesota, from New York to California, covering all types of jobs and materials—shows these units move an average of 85 yds. per hour . . . The L-40 possesses the Speed, Power and Endurance to produce such yardage, yet in weight and price it approximates most 1/2 yd. units . . . Is it any wonder contractor acceptance has made the L-40 the fastest selling 3/4 yd. machine in the world. Such performance merits your investigation. Write for descriptive material, today!



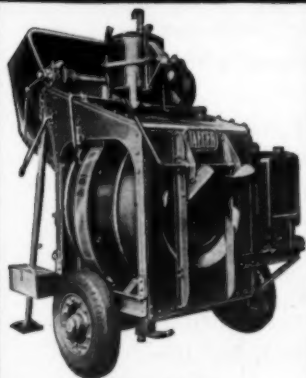
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LORAINS
MOVE MORE MATERIAL. FASTER AT LOWER COST

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BUYING A MIXER?



DEMAND:

- Faster Charging and Discharge Speeds,
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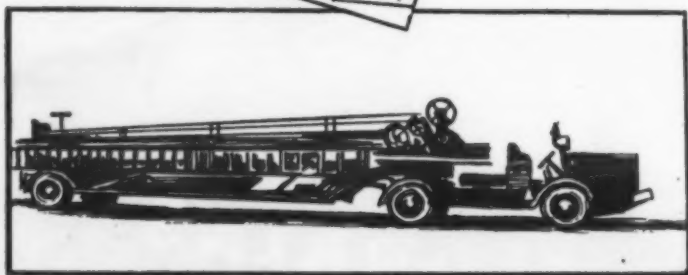
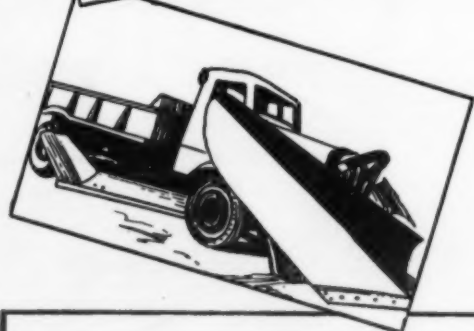
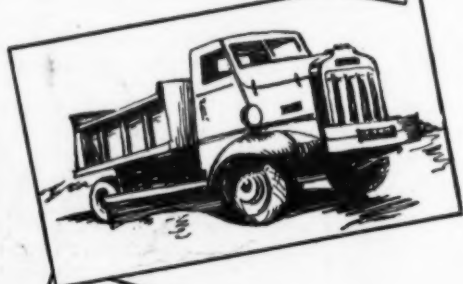
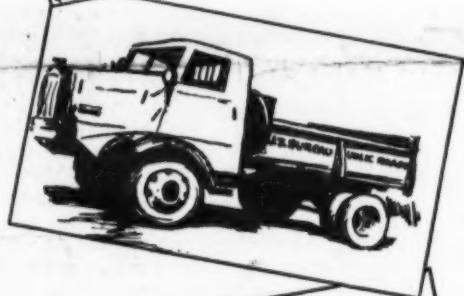
DYNAMITE ON WHEELS *You Get More Than* **FOUR-WHEEL DRIVE**

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WALTER FOUR-POINT

(100% TRACTION)

POSITIVE DRIVE MOTOR TRUCKS



A Walter Motor Truck is more than a four-wheel drive truck, it is a Four-Point Positive Drive Truck. A four-wheel drive truck, in hard going, can and must slip two wheels, while the other two stand still—RESULT—50% Traction. A Walter Truck is equipped with three Automatic Locking Differentials, which does not permit one, two, or three wheels to slip or spin while the others stand still—RESULT—100% Traction.

Its worth is proved in the hauling of heavy loads up steep grades, in the mountains from California to Washington; in the oil fields of Texas; in the coal region of Pennsylvania, and wherever snow is a hazard in the United States and Canada. The Walter has never been outperformed in plowing snow, or where traction is needed most.

That is why Walter guarantees One Hundred Percent Traction, Four-Point Positive Drive; not just under certain conditions, but under all conditions at all times.

WALTER MOTOR TRUCK CO.

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RIDGEWOOD, QUEENS, L. I., N. Y.

Send for descriptive literature

The County Shop Saves Road Money

No More Big Bills Just Because
"The County Is Paying For It."
In Fillmore County, Nebraska,
"Costs Cut" Says R. D. Hampton

ONE of the most interesting and important aspects of the construction and maintenance of a county highway system is the county shop, equipped with necessary tools and supplies, says R. D. Hampton, County Highway Commissioner of Fillmore County, Nebraska. In fact, according to Mr. Hampton, the first thing a county should do is to get out of the old hap-hazard way of doing things, get on a business basis and stand on its own feet.

"I can look back over the past fifteen years," said Mr. Hampton, "and remember the time when we did not have a monkey wrench to work with. We had an old tin shed for a shop and when we wanted to get a grader blade sharpened, it was taken to the local blacksmith, who hammered it out and charged \$1.00 a foot, because 'the County was paying for it.' This was true not only of the blacksmith but almost everyone else took a crack at the County in the same way. It has always appeared to me as a 'racket' and I take a great deal of pride in having an organization which has grown away from those ideas."

Modern Up-To-Date Shop

Today Fillmore County has a county shop of brick construction, 50 x 80 feet, and an annex 24 x 100 feet, furnace-heated and well-lighted. It is equipped with a heavy-duty trip hammer, welding outfit, large motor-driven draft forge, lathe, power hack saw, grinders, drills and tools. There is also a storeroom carrying a \$4,500 stock of parts and supplies. The county purchases its steel in car load lots and also its gasoline and oil.

Here the county employees overhaul and rebuild all of their own equipment. During the past five years they have purchased one piece of new equipment and used tractors, trucks and other units and rebuilt them in their own shop. This is an example of the asset which a well-equipped shop and an organization that functions can be to a county highway department.

Scope of County Work

Fillmore County Highway Department builds all its own roads, of which there are 1,164 miles. Of this 290 miles are paved or graveled, making one mile out of four an all-weather road. This department also fabricates its own steel and constructs its own bridges and concrete structures.

During the past three years, in spite of short crops in that section, the department has been operating full time and



The Fillmore County, Nebr., Highway Shop, Showing at the Left the Steel Racks and Rolling Tables Where the County Fabricates Its Own Steel Bridges

has graded and graveled 83 miles of county highways in the last two seasons. During 1935 they built 32 steel bridges and concrete culverts.

The county employees work all of the year and include mechanics, patrolmen, grader men, engine men, truck drivers and others. Many of the men have been with the department over 10 years and every man takes pride in the organization. Though they have had to take re-

ductions in wages, along with everyone else, during the past few years, their attitude on that point is illustrated by one of them who remarked cheerfully "Well, we and our families are still eating three meals a day."

Financial Status

There are no warrants out on any of the Fillmore County funds and there is a surplus in each fund. They also have

the lowest tax levy of any county in the State of Nebraska. That the work of the county highway organization can be carried on within the financial limitations set forth is attributed by Mr. Hampton to the fact that his department is organized on a business basis and that his modern well-equipped county shop makes it possible to keep their equipment operating efficiently and economically.

FIRST

- IN EVERYTHING



These "Caterpillar" Diesel Tractors use only about 10% worth of fuel an hour as they pull Athey two-way wagons in tandem, atop South Mountain, near Hagerstown, Md.

For bulldozing, hauling, scraping—for everything—"Caterpillar" Diesel is "the world's FIRST tractor" in road construction and maintenance. The SHOW-DOWN shows why, because it shows that "Caterpillar" is first in power and first in performance . . . first in low operating cost (cuts fuel expense 60 to 80%) . . . first in stamina and low up-keep . . . first in long life. You'll cut costs, speed work, improve

bids with "Caterpillar." The last word in tractors—it's FIRST! Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

THE SHOW-DOWN SHOWS THIS:

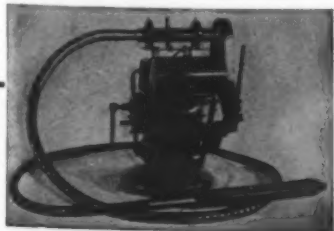
Report from a Massachusetts highway job: "Our 'Caterpillar' Diesel Tractor hauls two 12-yard wagons on a 1200-ft. haul from borrow pit to fill. The average round trip is completed in 12½ minutes, over a 20% grade for part of the trip."

Says a Pennsylvania owner: "Our first six 'Caterpillar' Diesel Tractors have worked more than 8500 hours each and are still setting records for low-cost operation."

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DIESEL



Concrete VIBRATORS AND GRINDERS

Write for Circular on types, sizes and prices

White Mfg. Co.
ELKHART INDIANA

Jersey Highway Paved Speedily

(Continued from page 2)

Various methods were considered for attaching the sheet metal strip for weatherproofing the longitudinal joint to the inside of the form adjacent to the second strip. This problem was finally solved by drilling the form for wires which when inserted around the strip and twisted on the outside held the strip tight against the form. Drilling was done with two 3/4-inch Black & Decker electric drills operated by the portable Master generator which later furnished power for vibrating the concrete against the forms and at the expansion joints.

As soon as the forms were lined up, the first fine grade crew of four men and a foreman came through with a steel strike-off subgrader pulled by the 5-ton Fordson roller, cutting the grade to a true flat surface. This subgrader is the product of the mind and skilled workmanship of Walter D. Olsen, one of the contractor's concrete superintendents and was first used on a state highway project on U. S. 303 in Blaauvelt, N.Y. (See C&EM for July, 1933). Levers control the depth of cut of the blade so that if the going is hard, thin slices of material can be removed until finally the true grade is reached. This first fine grade crew checked its work with a gradeboard. The grader and roller operator was one of the first fine grade crew.

The second fine grade crew consisting of two men followed up immediately with a hand pulled strike-off and then leveled off all loose material with a hand drawn lawn roller for final checking of the grade with their gradeboard.

The dual drum paver was operated on the shoulder and all expansion joints were set well ahead of the paver. Two men made up the crew setting the transverse joints 56 feet 3 inches apart and two other men set the metal strips for the premoulded longitudinal center joint which was set by the second paving crew.

The reinforcing mats set 2 inches below the top of the forms were fabricated with Truscon reinforcing bars by subcontractor M. C. Smolensky of Hillside, N.J., who has specialized in this type of work for many years. The reinforcing bars were spotted along the shoulder and then assembled in a wooden frame and quickly tied with wire clips and strung along the shoulder close to the grade to minimize the time element in placing them after the concrete had been struck off to receive them.

Three men on the skip, with the leader spotting and dumping the batch trucks, emptied the eight bags of cement which arrived right side up with each batch. This is another novel scheme developed by Olsen and first used by S. J. Groves & Sons on an 8-mile contract between Weymouth and the Gloucester County,



C. & E. M. Photo

Putting the Two Coats of Paint on
Thousands of Channels for Expansion
Joints

N.J. line in 1931. (See C&EM for February, 1932). The cement bags are placed upside down at the back of each batch compartment in the batch trucks and when the batch is tripped, the bags come out right side up at the edge of the skip ready to be cut and emptied. The cement bags for each batch were packed inside of one of the sacks and hauled back to the batching plant by a service truck.

The dual drum paver, which is in reality one double sized 27E drum divided with a vertical partition in the center, gives each batch a 1-minute mix in each section permitting a continuous procession of batches through the paver. The machine averages 45 batches per hour and a maximum of 50 which is "tops" for putting batches through a single machine and insuring a 2-minute mix for every batch before delivery to the road.

The mixed batches with a minimum of water were spread by three men and then a converted Ord finisher was used as a strike-off to level the concrete 2 inches

below the top of the forms. Then two of the pit men brought in the reinforcing mats while the third used the Master electric vibrator along the edge of the forms instead of spading to eliminate honeycomb. This vibrator was driven by a gas engine and was normally carried on the Ord finishing machine with sufficient lengths of cable to the vibrator to handle the concrete between

(Continued on next page)

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WELL POINT SYSTEMS

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EXCAVATION

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Air operated vibrators for all classes of concrete construction including bridge deck slabs, dams and locks.

Portable Vibrating Screed Boards for highway pavements.

Special steam operated vibrators for placing hot asphalt mixtures.

Write for circulars and
engineering data

RENTALS SALES

**MUNSELL CONCRETE
VIBRATORS**

997 West Side Ave. Jersey City, N. J.

Pair of Pavers Push 12-Mile Job

(Continued from preceding page)

the paver and the finishing machine at all times. For quick portability the vibrator power unit was mounted on a pair of pipe handle bars terminating in a rubber-tired wheel so that when it was taken from the finisher, it could be quickly moved to any point desired.

A crew of four men handled the finishing. These included the master finisher, two helpers and a joint cutter. After hand floating, the surface was checked with a 10-foot Cleveland aluminum straight-edge, any low spots brought up and high spots worked down, the surface rechecked and then dragged with burlap and basswood broom to furnish a non-skid surface. A rubber-tired wheelbarrow was maintained just behind the paver to carry back concrete for joints and for making up low spots. The pneumatic tire rolled much more easily over the shoulder than the usual steel wheel.

Immediately after the surface water had disappeared, one man with an automobile which pulled an Aeroil spraying rig, covered the surface with a thin coating of Curcrete for curing, doing away with straw, earth cover or ponding. The edges of the slab were not sprayed but were banked with earth.

One man with a Ford V-8 truck and a helper removed and hauled the forms ahead for both pavers. The twisted wires which held the strips for the longitudinal joint material were easily and quickly cut with one swing of the sharp end of a pick, releasing the form after the pins had been pulled.

The 27E Crew

The Ransome 27E paver crew was about the same as that working ahead of and behind the dual drum paver except that there were about six less men in the crew. This difference was due to the fact that only one line of forms had to be set and progress was not as fast.

The State Highway Department drilling crew cored the pavement twelve days after pouring to determine the accuracy of the contractor's work and to test the strength of the concrete.

Dug Well and Brook Furnish Water

The contractor dug a well by the side of the road with a clamshell bucket about 3 miles south of the north end of the job. The well was about 25 feet in

diameter and furnished ample water for that section. A Barnes triplex pump delivered to the 2-inch pipe which was laid in 20-foot lengths along the shoulder with valves 300 to 350 feet apart. Each paver carried 300 feet of Goodall paver hose. A brook one mile east of the north end of the job furnished additional water supply by means of a C.H.&E. triplex pump delivering to the pipe line.

The Batching Plant

A Blaw-Knox 100-ton batching plant was set up 8 miles from the north end of the job on a siding near the New Lisbon station on the Trenton Division of the Pennsylvania Railroad. The double siding had room for six cement cars and about twelve aggregate cars. Both sand and gravel were delivered in gondola cars and handled either to stockpiles or to the bins of the batching plant by the two Link-Belt cranes with 1 1/4-yard Blaw-Knox and Hayward clamshell buckets. Two men cleaned up the cars, moving the scattered material so that it could be easily removed by the



C. & E. M. Photo

Vibrating Along the Forms

clamshell. An average of 18 cars a day of aggregate and cement were handled at this set-up, producing 588 batches in the best 8-hour day. Stone was furnished by the Warner Co. of

Penn Manor, N.J. and sand by Norcross Bros., Pemberton, N.J. National cement was used.

One man ran the batcher plant turning out the batches so rapidly that there was no delay as the parade of batch trucks arrived one after another at the plant. This new Blaw-Knox batching plant is equipped with a light which burns only when the beam is balanced. This not only serves to help the batch man to balance the beam quickly but also makes it easy for the state inspector to check the batches from his shack immediately opposite the batchman's platform. The average batches consisted of 1,132 pounds of sand, 1,452 pounds of 1 1/2-inch gravel and 1,462 pounds of 3/4-inch gravel with eight bags of cement.

The contractor kept two cars of cement open at a time with four men in each car unloading the eight bags to each compartment of the 2-batch trucks. With the job about one-third completed from the north end, giving a haul of 12

(Continued on page 29)



A quarter of a century of continuous service is an exacting test for any road. Yet such records are not unusual with Tarvia. Many highway officials can tell you of long-lived Tarvia roads like South McNeill Street, Memphis, which was Tarvia-built in 1911. Experience has shown that Tarvia roads are easy and inexpensive to build and require only the most economical maintenance to keep them smooth, easy-riding and skid-safe. The Tarvia field man is at your service. Phone, wire or write our nearest office.

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.



South McNeill Street, Memphis, Tennessee. Tarvia-built in 1911, the year of the first transcontinental aeroplane flight—flying time, 84 hours, 2 minutes!

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for that
"after-Election Bet"

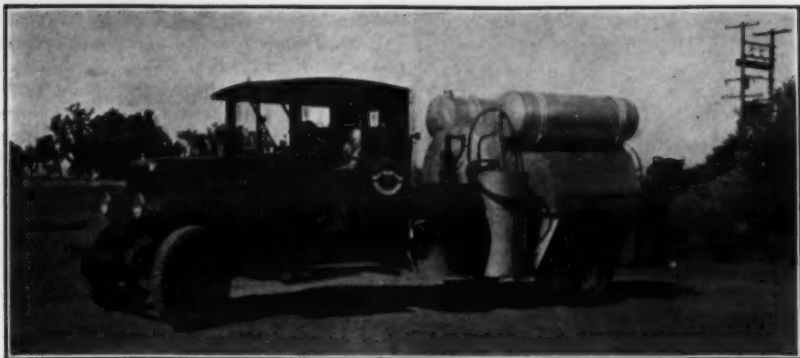
Win or lose, it will be a pleasure to use one of those latest DeLuxe Lansing Barrows. Latest improvements . . . more room for knee action . . . handles adjusted for speedier pick-up . . . noiseless running.

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PNEUMATIC-TIRED BARROWS

LANSING
COMPANY

LANSING, MICHIGAN

CHICAGO NEW YORK PHILADELPHIA
BOSTON KANSAS CITY MINNEAPOLIS
SAN FRANCISCO



C. & E. M. Photo

Hemstreet & Bell's Traveling Service Truck, Which Carries Fuel, Water, Air and Lubricants

Traveling Service Truck

(Continued from page 1)

There is a 55-gallon drum of motor oil and a drum of universal grease, as well as a home-made compressor for replenishing the air tank and blowing out the various things that need that kind of attention so as to work properly. The grease guns for each type of lubricant are carried on this side in a special dust-tight container.

On the side with the water tank are a barrel of high pressure chassis lubricant, a barrel of transmission or gear oil, a barrel of hydraulic hoist oil, and a barrel of tractor roller lubricant.

This assembly of materials for the complete lubrication of all the equipment on the job when and as needed was developed in the Hemstreet & Bell shop at Marysville, Calif., and the firm is justly proud of the truck which can tackle anything in the greasing and refueling line on a Hemstreet & Bell job.

Cement Co. Enlarges Plant

The construction of twelve storage silos holding over half a million sacks of cement and nearly doubling present storage capacity, and of a new electrically-operated packing and sack handling plant that will increase present facilities by 50 per cent, will begin shortly at the Independence, Kansas, plant of the Universal Atlas Cement Co., a subsidiary of the United States Steel Corp.

To be built of reinforced concrete, each of the twelve silos will be 80 feet high and 26 feet in diameter. A compressed air pump, electrically driven,

will convey cement from the mill to the storage silos at the rate of twenty sacks a minute. A screw conveyor system powered by electric motors will carry cement as required from storage to the new packing plant for sacking and delivery to nearby cars.

Cordes Heads Blaw-Knox

Frank Cordes, Senior Vice President of the Blaw-Knox Co., Pittsburgh, Pa., has been elected President to fill the vacancy caused by the death of Irvin F. Lehman. Chester H. Lehman was elected a Senior Vice President and George L. Dumbauld was elected a Vice President in addition to the position of Treasurer which he had previously held.

Planning for Tax Economy

With the increasing complexity of tax laws, Federal, state and local, it has become more and more necessary for business men in all fields to be familiar with tax legislation and, for their own protection, to be acquainted with permissible tax saving procedures.

"Planning for Tax Economy," by William H. Crow, LL.B., and U. S. Greene, C.P.A., is a taxpayer's money saving guide, covering all Federal, state, and local taxes, explaining how to avoid

the costly mistakes resulting in unanticipated tax consequences, how to determine quickly the tax position in dealing with property, organizing and conducting a business, financing, purchasing, selling, obtaining and extending credits, arranging mergers, consolidations, reorganizations, or dissolutions.

Copies of this 1,088-page reference and guide book may be secured from Waldrep-Tilson, Inc., 565 Fifth Ave., New York City. Price: \$7.50.

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SYSTEMS

Keep Your Wet Jobs Ahead of Schedules
The choice of Contractors who investigate efficiency and cost
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FOR BIGGER
PROFITS"

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YD.

"You fellows who are shovel-wise; you'll find new things to talk about in the new 355 — things that make a big difference in the ability of a shovel to earn money for its owner."

The New **PH** MODEL 355

● Looking for a new way to step up your profit? Then, have a look at this new 355! See why dirt-moving costs have tumbled. Arc welding and high-tensile steels make it lighter and stronger—permit features never before found in a 3/4-yd. machine . . . tractor-type crawlers . . . smooth-working helical gears in both reductions . . . live circle with hook rollers that gives you easier swing without tipping strains . . . automotive-type foot pedals to lessen fatigue . . . light-weight, alloy steel dipper that scoops up a bigger pay load at every pass. It's an all-round, high-speed machine that cuts time, cuts costs and cuts bids on a wider range of jobs. Ask for the new bulletin that describes it.

Your copy of Bulletin X-10 is waiting for you. Write for it today.

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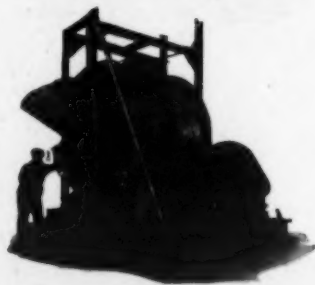
4419 W. NATIONAL AVE. Established in 1884 MILWAUKEE, WIS.

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PH

PACEMAKERS - FASTER ON THE JOB

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**Millions of Yards of
Concrete Mixed in
Ransome Big Mixers**

- Paving Mixers
- Pneumatic Placers
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**Ransome Concrete
Machinery Company**

Dunellen, New Jersey
Cable Address "Racomaco-Dunellen"

New Continuous Dual Arc Control Welders

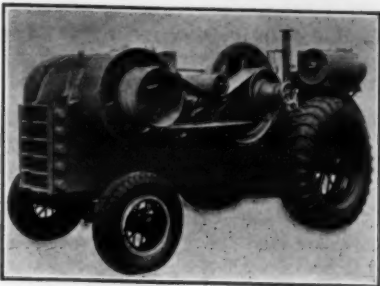
A new line of single operator arc welders, to be known as the Shield Arc SAE and which will supersede the present type of Shield Arc welders which have been on the market for the past six years, has been announced by the Lincoln Electric Co., Cleveland, Ohio.

The main feature of this new line of welders is a new method of arc control which makes possible the adjustment of both arc heat and arc penetration in a continuous sequence of fine increments. It is claimed that this continuous dual control assures uniformity of performance at every control setting and adds to successful operation of arc welding.

It is a well known fact that for certain types of arc welding a low voltage with a wide range of current control is desired. For other types of work a higher voltage with the same wide range of current is desired. This new welder permits the use of the correct voltage and current for all classes of work in the range of each size of machine.

The new Shield Arc SAE welder retains all of the other design points of the former Shield Arc models, such as independent excitation, laminated magnetic circuit, all-purpose meter, polarity reversing switch, no voltage motor protection. The base and portable parts have been redesigned for a more streamline effect and shorter wheel base. These welders are available in the following types and ratings: A-C motor driven, in 200, 300, 400 and 600 amperes; D-C motor driven, 300, 400 and 600 amperes; generator for belt or couple service, 200, 300, 400 and 600 amperes; and engine driven, 200, 300, 400 amperes.

A demonstration of this new welding unit will be the feature of the Lincoln Electric Co. exhibit at the National Metal Exposition to be held in Cleveland, Ohio, October 19 to 23. Another recent Lincoln welder development, the new SA-150, a small welder with a rated capacity of 45 to 200 amperes, will also be demonstrated.



The New Eagle Roadside Crusher

One-Unit Rock Crusher

The new Eagle one-unit rock crusher, recently announced by the Eagle Crusher Co., Galion, Ohio is designed for service as a heavy-duty roadside crushing unit. The crusher, with a 35-hp motor and heavy transmission, is built into one complete unit, having two speeds forward and one reverse. It may be equipped with either steel wheels or pneumatic tires and weighs approxi-

mately 12,000 pounds. It may also be obtained with a loading elevator.

This crusher has a capacity up to 10 cubic yards per hour and may easily be adjusted for crushing $\frac{1}{4}$ to 3-inch stone while in operation.

Complete information may be secured direct from the manufacturer by mentioning this magazine.

A New Design of Chain For Dragline Buckets

Cast manganese steel dragline bucket pulling and hoisting chains were first introduced by the American Manganese Steel Co., Chicago Heights, Ill., in 1928. Now this company has announced a new design of dragline bucket chain, on which a patent has been applied for.

The features of this new chain includes its increased strength over previous Amsco chain; full line instead of point bearing between links; additional metal on the sides of links where abra-

sive wear comes; lighter weight; tie bar across the link to prevent snarling and kinking; equalized metal sections to insure perfect heat-treatment in manufacture and consequent better physical properties; clean lines making for clean castings; and the strength, toughness and wear resistance which are characteristic of the heat-treated austenitic manganese steel of which they are made.

A TRAILER

For

Every Heavy Duty Requirement
The LaCrosse TuWay

- Fully Reversible—Pulls from either end
 - Brakes on all wheels controlled from either end
 - Pneumatic Tires
- Meets all road width restrictions
Trailers of all types and up to any capacity.

Write or Wire

C. R. JAHN CO., LaCrosse, Wis.

International Trucks handled 80 per cent of the heavy hauling at Boulder Dam

IN 1931 Six Companies Inc. began the building of Boulder Dam. Today the tourists look down in awe as they ride a highway 730 feet above the Colorado River bed. The finished barrier blocks the canyon. Boulder, world's greatest dam, stands complete—two years ahead of schedule.

The certificate of appreciation presented to International Harvester by Six Companies Inc., and reproduced here, is a reminder of the service rendered by International Trucks in this celebrated project. Other equipment of this engineering age also played its part, but to Internationals fell the major share of the heavy hauling.

We ask the construction industry and all users of trucks to note that the number of Internationals at Boulder Dam practically doubled all other heavy-duty makes combined—outnumbered any other single make in excavation service by more than five to one. The great fleet of International Trucks handled 80 per cent of the heavy hauling, accounted for

something like a million loads into and out of the canyon, performed brilliantly from start to finish in the fifty months of Herculean action in the building of Boulder Dam.

International Trucks, from Half-Ton to powerful Six-Wheelers, serve all hauling needs. Chassis prices \$415 up, f.o.b. factory. Low time-payment rates apply on all models. Company-owned branches and dealers at your service.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
606 S. Michigan Ave. Chicago, Illinois

Boulder, world's greatest dam, as it now stands complete in the canyon of the Colorado. Before construction began, millions of yards of rock and earth were removed. Now, nearly 6,000,000 barrels of cement and 60,000 tons of steel and other metals form the barrier impounding a lake with an area of 227 square miles.



NOW—at BONNEVILLE

In evidence of lasting quality and stamina, veteran Boulder Internationals are working today in the making of Bonneville Dam, on the Columbia. This illustration shows a new 5 to 10-ton International Model A-4 at Bonneville.

INTERNATIONAL TRUCKS

BURCH DUMP BODY HOIST

with
BALANCED POWER
FOR LOWERING OR RAISING

ONLY
ONE
MOVING
PART

Balanced power for raising or lowering—automatic locking, any position—one moving part—no gears—no oil lines—no heating or foaming of oil. Plain and Braced Side Bodies— $1\frac{1}{2}$ and 2 Yard capacities.
FAST! POWERFUL!

Write for Literature

THE BURCH CORP.
Dept. F—CRESTLINE, OHIO

Divers' Work At Bonneville

(Continued from page 2)

When they are sunk it is found that here and there a boulder or part of a reef, that did not appear on the chart of the bottom, projects upward. It is then up to the diver to go down and drill and blast out this rock.

The drilling is sometimes done with a portable pneumatic drill which he takes down with him, and sometimes it is done by means of a long drill rod operated from above. In the latter case, he merely guides the drill. Finally, he loads the hole with anywhere from one to ten sticks of dynamite. This is all done in water up to 60 feet in depth and considerable current, and with the crib already down there and awaiting only the removal of the obstruction to settle into place.

After the cribs are placed and before the steel piling is driven, frequent inspections are necessary to see that everything is all right and there have been no movements. Last winter, the divers were called upon to do this when there was such a thick covering of ice on the river that it had to be broken by dropping heavy weights upon it. The divers went down through holes in the ice, a cold and cheerless task. Similarly, in the case of sheet piling, it is necessary to go down and locate any openings that may be present which will let water through when the cofferdam is unwatered.

On another occasion a diver went down inside a V-shaped bulge in the steel piling. This bulge is an expansion joint on the pressure side of the cofferdam and is somewhat larger than the regulation expansion joints located at regular intervals. The reason is that at this point and about 13 feet down there was a 2-inch anchor cable, used in sinking the crib and attached to it, which had fouled off in the bottom of the river. This would interfere with the driving of the apex pile in this group and the only thing to do was to go down and cut it off.

One of the photographs shows what appears to be a football huddle being held on the divers' barge. In the foreground is the foreman of a pile driving crew ready to put down on paper what Diver Vance found on a sojourn below. They were driving square timber piles against the crib at this point. The bottom was full of obstructions at this location and many of the piles refused to penetrate. The diver had to go down, then, locate the point of the pile and if possible arrange for the removal of the obstruction. Or else he might have the suggestion to make that the wood pile be shod with a metal point of a certain shape, if that would help. He remembers all the particulars of the location, and when he comes up the plan of how to overcome the difficulty is sketched on paper for the foreman's guidance.

Here is another example of how the divers "earn their keep." A solid row of 107 interlocking steel piles had been bent over by the flood and could not be brought back into position or pulled. The divers went down and with the submarine torch cut them all off at the mud line. The piles could then be removed and salvaged. The contractor could either weld the cut-off pieces together into full lengths, or, if he had been so disposed, he could have sold them in the second-hand market for \$2.50 per linear foot.

For a long time, water has been going through the generator openings in the power house. A large number of these openings will not be used at first until the full generator equipment is required. So concrete stoplogs, accurately fitted, are being cast to fill the openings. As the time comes for installing them, the

guides are found to be more or less filled with mud and debris, so it is necessary for the divers to go down and clean them out so that the stoplogs will seat accurately. In the case of the third step cofferdam, which is, so to speak, clamped on between pairs of piers of the spillway, so as to close them off and permit the space between to be dewatered in order to pour the concrete for the apron up to the final level, the divers must go down and fit the pins which hold the third step cofferdam in place.

Lost and Found

To the individual mind, tuned to the individual pocketbook, it would seem like a calamity to drop a piece of equipment costing many thousands of dollars into the river. But on a contract job

such as this, involving forty or fifty million dollars, a little thing like that does not cause even a flurry. Every once in a while a bulldozer or a steam shovel or a truck goes in.

At the present time a large whirler crane reposes in the bottom of the north side cofferdam so completely covered with mud that it was impossible for the diver to get a line on it, so it will stay there until unwatering and excavation bring it to light.

In most cases, however, a shovel overboard is just another job for the diver, to go down and locate this lost equipment and assist in the rigging of tackle that will lift it out. There are plenty of rigs about that will do it, cranes, shear-legs on barges, the mammoth walking dragline on shore, and over all the twin

cableway. They can pull out anything they can get a line on. But without the diver it might be a long and difficult task to get that line rigged and the equipment safely above water once more.

A Correction

In the article on the Argentine federal highway construction program which appeared in the September issue of *CONTRACTORS AND ENGINEERS MONTHLY*, the fund allocated for this work should have been given as 300,000,000 pesos, instead of 300,000,000,000 as erroneously stated.

In Colorado, a road-mix job 20 feet wide costs \$1,200 a mile per inch of thickness.

TESTED

TESTED ON FT. SMITH WATER SUPPLY JOB
"If the 'LO' is as good as your Model 'L', it will do." M. E. Gillioz "tried out" his first six Oil Tractors near Mountainburg, Ark., (of Bob Burns fame) building a water supply dam for Fort Smith, 30 miles away.

PROVED

PROVED ON CEDAR POINT, KANSAS JOB
After their successful "test" in Arkansas, Gillioz moved the original six "LO" tractors to Cedar Point, Kansas—an eight mile project. They further proved their ability to "test" the "LO" tractors.

FIRST .. 6 OIL TRACTORS ... THEN *8 more* FOR GILLIOZ

IN THE VERY HEART of the great Skyline Highway job ... M. E. Gillioz of Monett, Mo., is carving 17 miles of scenic highway out of steep, rocky mountainsides. A big contract ... involving 1,000,000 cubic yards ... but all in the day's work to Gillioz. For dependable performance that would assure getting the work done on schedule ... this successful contractor selected Allis-Chalmers Controlled Ignition Oil Tractors. Besides Diesel fuel oil economy, A-C Oil Tractors have such advantages as smoothness, balance and instant starting, made possible by controlled spark ignition. No wonder Oil Tractor owners repeat!

ALLIS-CHALMERS *Controlled Ignition* OIL TRACTOR DIVISION—MILWAUKEE, U. S. A.

New Rules and Regulations Of Calif. License Board

The Contractors' State License Board of California has adopted new rules and regulations as amended to conform with the recommendations of the Attorney General, and has ordered the Registrar of the Contractors' License Bureau immediately to place its operations under the new regulations, which call for the use of an application form requiring more information about the applicants' past experience in the construction business. It also requires the securing of seven sponsors by every individual, and four by each member of a co-partnership or officer of a corporation. The new application will further require that appli-

cants for licenses under fictitious names must first register in accordance with the Civil Code of the State.

Highways and Finance In Minnesota in 1932

A cooperative research study by the U. S. Bureau of Public Roads and the Minnesota State Highway Department, entitled "Highways and Public Finance in Minnesota in 1932," and prepared by H. R. Briggs and A. W. Barlett of the Economic Research Force of the Bureau of Public Roads headquarters at Madison has recently been published.

This study comprises extensive investigations into revenues and expenditures on state, county and township highways

as well as government, public benefit and education, including debt and debt service. There is also included a study of the use and travel upon all highways and its origin. The year 1932 was selected as representative of normal relationship between state and local government, as these relationships at that time had not been affected by Federal relief expenditures.

The Bureau of Public Roads is now engaged in a state-wide highway planning survey in cooperation with the Minnesota Highway Department together with forty other states to bring this information up to date, in order to project, with the aid of this information, a 10 and 20-year highway planning program on all classes of highways, including the Federal-Aid system.

Oil-Aggregate Mix For Low-Cost Roads

(Continued from page 5)

vision, using the surface area factor. The per cent of 200-mesh material is usually required to be between 7 and 8 per cent.

The amount of moisture in the aggregate was at first required to be below 2 per cent but since experience has shown that better results are obtained by keeping the moisture below 1 per cent, the specifications have been so changed.

After the mix has been determined, the plant inspector makes frequent analysis of the aggregate and checks the results by several extractions each day during operations.

Road-Mix Method

On one small project built by the road-mix method during the past year, the difficulties inherent with this method under favorable weather conditions were clearly evident. With the amount of fines and low moisture content required by the specifications, frequent rains caused delays and considerable extra expense. It was necessary to dry aggregates on the road by harrowing and blading and when it rained just after the oil was applied, considerable extra manipulation was necessary to remove the moisture from the mixture.

Mixing and spreading by the blade method requires first class equipment and experienced operators. Under the labor regulations in force on Federal-financed work, it is sometimes difficult to obtain the results desired. For this and other reasons, the Michigan State Highway Department favors the stationary-plant mix method of construction with mechanically-controlled spreading.

Stationary-Plant Mix Method

This method, somewhat higher in first cost, results in a more uniform mixture due to the facilities for proportioning aggregate, control of moisture content and amount of oil. The essential parts of a plant are a drier capable of reducing the moisture content of the aggregate to below 1 per cent with a temperature of less than 250 degrees at the time of mixing, a screen and bins to divide the aggregate into fine and coarse sizes, a weigh box to weigh accurately each size of aggregate and the filler, bucket and scale to give close control of the amount of oil, and a twin pug-mill mixer.

On the three projects of this type built during 1935, standard hot-mix asphalt plants were used because the contractors had them available. These plants were equipped with internal oil-fired driers, two screens and bins, weighing apparatus for aggregates, dust and oil, and twin pug mixers.

Plant Equipment

Since the oil-aggregate type of surface is designed to meet the demand for a low-cost road, portability and simplicity of the manufacturing plant, consistent with reasonably uniform mixture results, and the use of available aggregates, are important considerations. Plants that can be transported in units on trailers over the highways to aggregate deposits, away from railroads, are desirable. Some such plants are now on the market and others are in process of design.

The design of driers used on hot-mix plants is not entirely suitable for oil aggregate construction. For hot mixes, aggregates must be thoroughly dried and heated to a temperature of about 375 degrees F. but in oil-aggregate construction, the aggregates as a rule need only be surface dry and a moisture content up to 1 per cent will not prevent good results. Drier design, making

(Continued on page 24)

APPROVED!

8 MORE ORDERED FOR THE SKYLINE JOB
Awarded 17 miles of the famous Skyline Highway in Virginia's Blue Ridge Mountains, Gillioz relied on the tractor that had proved itself on previous jobs — ordered eight more Model "LO" Oil Tractors. Shown here are "LO's" with bulldozer and 12-yard A.C. wagons, working on the million yard contract.

TRACTORS

Paper on Special Cements For Mass Concrete

An exhaustive technical report on "Special Cements for Mass Concrete" by J. L. Savage, Chief Designing Engineer of the Bureau of Reclamation, has just been issued by the Bureau. This report is a summary of all the available information and experience in this country on the subject, putting in concise form knowledge gained from the con-

struction of Boulder Dam and the experiments which preceded this construction and that of Grand Coulee Dam. These investigations have reduced to a minimum the shrinkage stresses and virtually have eliminated cracking of large concrete masses. They have also minimized the effect on concrete of the disintegrating elements.

The report, which contains 230 pages and 78 figures and formulae, was printed by the Bureau of Reclamation, Department of the Interior, Washington,

D. C., as its contribution to the Second Congress of the International Commission on Large Dams which met with the World Power Conference in Washington. Copies are available at 75 cents each at the offices of the U. S. Bureau of Reclamation in Denver, Colo., and Washington, D. C.

A. R. Ellis Made PTL Head

A. R. Ellis, who became associated with the Pittsburgh Testing Laboratory

as a laboratory technician in 1905 upon his graduation from Cornell University, has been made President of this nationally known testing and research organization.

Mr. Ellis became Chief Engineer in 1910, Manager of the New York branch in 1917, Assistant General Manager and Director in 1921 and Vice-President in 1929. He is a member of the American Society of Civil Engineers, the American Society for Testing Materials and other national engineering societies.



WINTER WRECKS
ROADS if it gets a chance

**A DOLLAR SPENT *NOW* ON ROAD
PROTECTION WILL SAVE TWO DOLLARS
*NEXT SPRING!***

**INSPECT YOUR ROADS *NOW*
AND PROTECT WEAK SPOTS
WITH ASPHALT!**

"Winter-proofing" also applies to roofs. Now is the time to protect roofs from winter snows and water seepage, by using proper grades of roofing Asphalt.

There's no question that frost, ice, snow and thaws bring havoc to roads which need repairing or renewing. If nothing is done about it *NOW*, damages next spring may amount to thousands of dollars. Larger holes, wider cracks, deeper ruts will see to that!

Before it's too late, find out how others have made dollars go farther by protecting paved and treated roads, *before* winter comes, with *Asphalt*. Weak points and holes in paved roads can be eliminated at very low cost. Bituminous roads and railroad crossings can also be made "winter-proof". All winter long and in the spring as well, you'll have good roads at low cost-per-mile.

Your local Standard Oil representative is ready *NOW* to co-operate with you in protecting your roads—and roofs too—against Old Man Winter. This service is yours for the asking and without obligation.

Copr. 1936, Standard Oil Co.

ASPHALT

goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . IN DISTRIBUTION OF LABOR . . . IN TAXPAYER SATISFACTION

Fighting Snow Storms With Well-Laid Plans

By K. I. SAWYER, Superintendent,
Marquette County Road Commission,
Michigan

PREPARING for snow storms means planning a service on which life and comfort may depend, and by which practically all human activities are affected. Preparations must be predicated on an intimate knowledge of the problems of your community and plans made to provide service within the reasonable limits of time and safety.

The greatest possible service in snow removal where funds are limited, and this is the situation faced by most county highway organizations today, involves an accurate knowledge of the county and its economic and human needs. Whether you make a survey consciously or otherwise, knowledge of the type known as an economic survey, as well as the physical characteristics of your county, is essential. This information will disclose for direct use the roads on which full-time service must be provided, the roads on which service must be provided at certain times, which roads can be given attention as it is possible and which roads need not be included in a snow removal program.

With this knowledge, an operating layout can be mapped out. We have found it useful to plan the plow program in definitely established plow runs, with each plow planned for. First must be planned the maintenance of continuous traffic during a storm on the most heavily traveled or most economically important roads, and next the opening up of the less important roads in the territory, thus utilizing the personnel and equipment on work in its successive order of importance.

Selection of Equipment

Having gained a knowledge of the requirements of your snow removal work, the next step is the selection of equipment.

There is, in my belief, no one type of equipment which is universally applicable or which will handle economically all the situations in a given community. Fighting snow storms within the time limits required for adequate public service necessitates fast moving equipment, such as the truck-type displacement plows. The selection of the truck and plow types is dependent on the physical character of the plow runs. Weight and power of truck, type of truck drive, and type of plow as to speed or heavy duty, are matters which should be considered in planning to meet a given situation.

In our territory, service throughout the winter requires that truck plowing

Knowledge of Territory, Carefully Selected Men and Equipment Necessary to Keep Roads Open

be supplemented with rotary plows or tractors powerful enough to maintain plowed widths on our roads which will permit truck plowing during the late winter storms. Economical operation also requires that we have some light fast truck equipment to clean up after the light storms and behind the tractors.

Training the Personnel

Probably the most difficult part of preparing a snow fighting schedule is

the training of a personnel to handle the equipment. I consider it essential to have a minimum of three good operators who have an intimate knowledge of each plow run. In addition, each operator should have a fair knowledge of one or two other runs to which he may be assigned as relief. Properly selected and trained helpers are also needed.

To put an inexperienced driver on a snow plow, or even an experienced operator on a strange road under the conditions existing in a severe snow storm is very hazardous and often results in expenses for repairs and damages. Fighting a big snow storm is severe on operators and equipment, and preliminary knowledge and experience are essential.

Snow Fence

Snow fence protection is a very important part of preparing for snow storms. Thus far we have been unable to erect all the snow fence necessary to take care of the 674 miles of road for which we are responsible. We have at present 57 miles of snow fence, most

of which is placed to assist in giving full-time service on those roads where full-time service is essential. A small part of our fencing is also used to avoid plowing where high-type road service is not required and where the erection of fences will usually eliminate several plow movements during the winter.

The position and type of snow fence used are of course determined by experience with the particular locality. Properly utilized, it will do away with much heavy equipment movement.

Arrangement of Other Details

One arrangement very necessary for the snow season is for advance notice of impending storms. In some cases, the state highway departments do this. It is usually possible, however, to arrange with your nearest weather bureau to wire or telephone notice of unusual impending weather conditions.

The movement of school children to central schools introduces a serious winter hazard which can be helped by

(Continued on page 31)



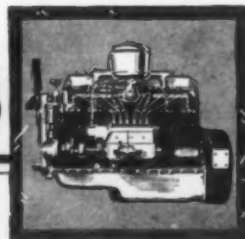
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drainage and paving—can be summed up in one word, *dependability*. Naturally Hercules Engines are dependable whether in industrial, agricultural or oil field machinery, or automotive equipment. For behind them lies a generation of practical experience on the part of an engineering organization which leading manufacturers everywhere consider to be the foremost in the heavy-duty field.

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Oil-Aggregate Mix For Low-Cost Roads

(Continued from page 21)

greater use of the principle of evaporation and consequent drying and cooling with a large volume of air, would no doubt produce greater efficiency and economy.

The mixing unit, found by general experience to be necessary for good results with oil mixture containing a large amount of fine material, is a pug mill mixer. Continuous pug mixer units with metered oil pumps have been in use, mostly in the traveling-plant method. Such units have large capacity for the size of the plant and are readily portable. If they are designed to insure an accurate and consistent mixture, they should be a very economical unit used as a stationary plant.

The various units of the plant should of course be coordinated with each other and with the capacity of the spreading equipment and aggregate production unit. Generally 40 to 60 tons of mixture an hour has been found a satisfactory and economical capacity.

Spreading and Rolling

On all the plant-mix projects laid during 1935 Adun mechanical spreaders were used. The best results were obtained by spreading the oil aggregate mixture in two or more layers to provide a good riding surface.

There are a number of other types of mechanical spreaders, similar in action, which have been used to advantage in this type of work throughout the country.

During warm weather, rolling with an 8-ton tandem roller is deferred until late in the afternoon or until the next day, but when the weather is cool, rolling follows immediately after the spreader. Straight rolling, once over, has been found to be the best practice, as excessive rolling while the mixture is warm or fresh caused checking and shoving. In the summer, a second or

third rolling on succeeding days was found beneficial.

Light traffic is allowed to pass over the freshly laid material to assist in compaction. During warm weather, traffic marks the surface for several days but light blading or dragging with a maintainer and additional rolling keep the surface in good condition until the light crust is formed on the surface. During cool weather, light traffic marks the surface only slightly and irons out the marks in a short time.

Scarifying and Reshaping

Several experiments in scarifying and reshaping have been made. One of these was carried on during the latter part of October when the temperature was around 60 degrees F. on a stretch of surface which had been laid and under traffic for a month. A special device made of railroad spikes set 2 inches apart was attached to the front blades of a maintainer to break up the mixture which was unusually stiff because of the

coolness of the air. This was followed by a large grader with a scarifier attachment pulled by a tractor.

On part of this stretch new mixture was fed through the maintainer at the rate of about 50 tons to the mile to blend with the old. Rolling followed reshaping.

This experiment demonstrated the fact that even though there was probably some loss of volatiles at the comparatively high temperature of mixing, workability was not sacrificed. It is reasonable to assume that if the mixture could be scarified in the cool fall temperature, it should be more readily worked in the hot weather of next summer.

Conclusion

A material which will provide a smooth, dustless, non-skid riding surface and yet lend itself to reworking is adaptable to many of our road problems. Since the mileage of roads demanding improvement is increasing and

the funds available are tending to decrease, engineers must give consideration to low-cost types of construction. While the road-mix method has produced good results in some locations, we feel that our climate and other conditions warrant the slightly higher first cost but more uniform results obtained with the plant-mix method of oil-aggregate construction.

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Above: Mexican Laborer.

Center: The Austin-Western Crushers were transported over 100 miles of this terrain.

Left: The No. 100 Portable Plant has a 9" x 40" primary roller bearing jaw crusher and an 18" x 38" roll (or 4" x 40" jaw) crusher for reduction crushing. All portable plants have oversize shafts and roller bearings throughout. Compact for easy transport on steel or pneumatic tired wheels, they can be set up for operation in a few hours. The Austin-Western Crusher Line also includes jaw and roll types.



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Light Truck Hauls 20 Tons on Test Run

With a gross vehicle weight of as much as 20 tons a 1½-ton Chevrolet truck transformed into a 6-wheeler by the installation of a Thornton four-rear-wheel drive, hauled, with a semi-trailer, a payload of more than 15 tons from Detroit to Boston and back over a round-about circuit of 2,639.9 miles. Included in the equipment were Bendix-Westinghouse automatic air booster brakes, a Stewart-Warner tachometer and a Veeder-Root Hubodometer. The semi-trailer was a Trailmobile, 22 feet long with tandem axles and both trailer and truck were equipped with Goodrich 32 x 6 10-ply Silvertown heavy-duty express tires.

The economy run was held under AAA sanction No. 3402 and the official figures show a cost of 3.62 cents for gasoline per vehicle mile, 0.172 cents for gasoline per ton-mile or gross rolling weight and a cost of 0.2392 cents per ton-mile of net payload for fuel and oil.

Bituminous Distributor For Highway Work

The South Bend Model 200 bituminous material distributor, made by the Municipal Supply Co., South Bend, Ind., has a rated capacity of from 300 to 2,000 gallons, applies 1/10 to 3 gallons per square yard, distributes any width up to 20 feet, and can be mounted on any truck or trailer.

The black sheet steel welded tank is elliptical to permit a low center of gravity. A 2-inch overflow pipe is placed within the tank with the discharge directed to avoid any part of the truck chassis or trailer. Four 6-inch longitudinal flues are located in the bottom half of the tank extending from the rear end to within 4 inches of the front end, at which point they are welded to return bends. Heat is carried forward through the two upper 6-inch flues and returned through the two lower flues to the outlet stack at the rear of the tank. Surge plates inside the tank prevent rapid shifting of material.

Two Aeroil high-pressure generating-type burners located at the rear of the tank, shielded from draughts, furnish heat to the flues in the tank. The burners are equipped with strainer and regulating needle valve, and will operate with kerosene or furnace oil. There is one fuel tank, of 40-gallon capacity, attached to the tank mounting frame. A ¾-inch Viking rotary pressure pump operated from the distributor engine supplies fuel under pressure to the burners.

The spray bars, of 2-inch wrought steel pipe with nozzles electrically welded on 4½-inch centers, total 20 feet in length, furnished in sections of lengths as selected, and are attached to the distributor with quick detachable connections. These spray bars are con-

structed so as to permit shifting 18 inches, 9 inches each side of the center, and are controlled by a lever within easy reach of the operator from the operator's platform, located at the rear of the tank mounting frame, accessible to all control levers. Other features in-

clude two Stewart-Warner tachometers, one for indicating road speed and the other for pump speed, thermometer, signal bell, and tool box for all the necessary tools.

Power is furnished by a Hercules 4-cylinder engine which with the pump is

mounted on structural steel channel sills set at the rear of the distributor tank.

Detailed specifications for these distributors are contained in a new circular which may be secured direct from the manufacturer by mentioning this magazine.

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★ Many State Highway Engineering Departments require the use of pneumatic tampers on back-fill which cannot be reached by the roller, especially where rigid pavement is to be laid over the excavated area. Cleveland No. 5 Back-fill Tampers will save you plenty of money on such work. And besides the saving, you get a better job. All the dirt goes back, and you have the ground as solid as if it hadn't been touched.

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The Hayward Company
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Hayward Buckets

Tygart Dam

(Continued from page 9)

from the four 84S tilting mixers in a continuous stream of material batched in accordance with three pre-arranged sets of weights. The three mixes used are: A, a 5½-bag mix for thin and reinforced sections; B, the mix originally intended for all mass concrete, but now used only for the outer 15 feet or face concrete; and B special, the mass concrete mix. The weights for the various materials are:

	A	B	B Special
Cement	1,551	1,269	1,128
Water	718	620	600
Sand	3,200	2,750	2,750
1-inch stone	3,500	2,400	2,400
2-inch stone	3,500	2,400	2,500
4-inch stone		3,000	3,050

These weights are in pounds, all for dry aggregate and for one 3-cubic yard batch.

Beneath the compartments in the Octobin are the four aggregate batchers, two cement batchers which are used alternately, and the water batcher. The dial scales, with the beams below on which are set the electric contacts for the three mixes as well as the electric contacts that indicate by lights on the control table whether the batchers are empty or full, are set to face the control table so that there may be visual checking of the operation at any time. This is scarcely necessary as the electric indicators on the control table tell the tale which is repeated graphically on a recorder to the right of the operator.

To start batching the operator has merely to set the batch selector for the mix desired and then push the fill control button immediately in front of him on the control table. This causes a red light to show in front of the eight material batcher indicator positions. When the batcher for each position is full to the correct weight the light changes to green, and when all lights are green the entire group is dumped into a mixer by throwing the charge lever at the right front of the table. This causes the green lights to flash off immediately as the batchers are not full and when empty the batching starts all over again. It requires but 5 to 6 seconds for the delivery of the batches to the mixer.

When batching is started the pneumatically-operated gates are opened by solenoid control, and when the weight of the aggregates reaches about 50 pounds of the final pre-determined weight the gate starts to shut and the fingers on the aggregate flow are cut in automatically, causing the aggregate to dribble in slowly to prevent overweight. A pair of buttons at the front of the table is used to operate the vibrators on the outer shells of the cement bins to insure ready flow in case of arching.

The graphic recorder consists of a ribbon of paper traveling at the rate of 3 feet per hour on which the filling of each batcher and the mixing time of each mixer are recorded by an individual pen. Thus the weights as well as the timing of the mixes by the four batch meters are recorded indelibly for future reference. The control table as well as the weighing batchers, the Octobin, and cement silos were furnished by the C. S. Johnson Co. of Champaign, Ill.

Mixers

Four T. L. Smith tilting 84S mixers completely lined with Stellite are set below the batching floor spaced 90 degrees apart and so arranged that they charge and discharge through the same opening. This feature permits the speedier charging of the batches to the mixers through the swivel chute controlled by the batch operator from the table above. After a 2-minute mixing time indicated by a bell on the batch meters located behind the operator, as well as shown graphically on the recorder chart, the mixers are discharged one at a time in sequence into a 9-cubic yard sheet metal lined hopper below. Flow from this hopper is controlled by a man in the

tunnel below who permits the concrete to flow uniformly onto the conveyor belt that carries it forward to the hopper on the trestle. The required flow is indicated by a signal from the man at the trestle hopper so that concrete will not be delivered too rapidly for the placing conditions.

Concrete Placing

The first conveyor from the hopper is 36 inches wide and 172 feet long. The belt, furnished by U. S. Rubber Co. running on Jeffrey idlers and driven by a 50-hp Westinghouse motor, carries the concrete up at an angle of 18 degrees to the transfer belt running at right angles to the first and upward at an

angle of 18 degrees and 30 minutes. This belt is 182 feet in length and is driven by a 40-hp Westinghouse motor. This second belt was not required when concreting for the first lift of the dam but is being used for the second and third lifts. The final belt for the second lift, running at right angles to the first transfer belt, is also 36 inches wide and runs at an angle of 19 degrees upward for 182 feet. It is driven by a Westinghouse 60-hp motor. The concrete belts are driven at approximately 350 feet per minute with the speed increasing slightly from the first belt on to prevent piling up of material.

The placing of the concrete in the
(Continued on next page)



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valve control, accurate application and no slobber or dribble feature on the spray bars.

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Tygart Dam

(Continued from preceding page)

various blocks of the dam is done from a structural steel trestle built up to three levels as the work progresses. The first level was 60 feet above the river bed and the other two are each 55 feet above the level below. The trestle is located so that the deck will be entirely outside of the dam section at the third lift. The dam itself will reach 60 feet higher than the third lift of the trestle and the concrete placed above the trestle will be placed with the gantry booms. The trestle is 30 feet wide with a walk on the upstream side and has three 36-inch industrial railway tracks in addition to the 30-foot gage gantry tracks.

The equipment operating from the trestle includes three Lambert-National whirlers mounted on the 30-foot gantries and having 95-foot booms. They are capable of handling $8\frac{1}{2}$ tons at 90 feet and 30 tons at 42 feet. Five Vulcan 10-ton gasoline locomotives with trains of two Easton 20-ton capacity flat cars with double trucks haul the 3-yard Blaw-Knox roller-gate concrete buckets from the trestle hopper at the end of the concrete conveyor system and the whirlers pick up the buckets and lower them to the block being concreted. The system of two buckets to a two-car train is used with an extra bucket which is being handled by the crane while the trains are shifting. The Easton cars are equipped with four "ears" for each concrete bucket position permitting the rapid spotting of the empty buckets on the cars. These "ears" are steel plates riveted to the car frame to form guides at the four corners of the bucket position and resemble ears, hence their popular name. Also between each pair of bucket positions on a flat car is a double ladder of structural steel permitting the hooker to mount the car to the full height of the bucket from either side and hook the bail to the crane.

The concrete crew on the block handles the dumping of the bottom-dump roller-gate buckets and works the two Jackson bulb-type mass concrete vibrators and the Jackson puddler for compacting the surface of the concrete at the top of a lift. The concrete is placed in 10-foot lifts in winter and 8-foot lifts in summer. After the concrete in a lift is brought to grade and sets for 2 to 5

hours, depending on the temperature, the surface is hosed off with a high pressure air and water jet to remove the sand and cement at the surface and provide a good bonding surface for the next lift. Between lifts and between adjacent blocks copper strip water stops are placed.

For curing the blocks a $\frac{3}{4}$ -inch water line perforated every 12 inches is carried around the four sides. Sprinkler heads are attached to a similar line on top of the block with a single head for each 200 square feet of surface. Sprinkling for curing is continued for 15 days.

Concrete production and placing to date has reached a maximum of 4,600 cubic yards in 24 hours. Present placing rate averages 3,500 cubic yards per day with 85,000 cubic yards a record month.

Labor and Safety

The working hours for the Tygart Dam organization are three 8-hour shifts for labor from 8 to 4, 4 to 12 and 12 to

8, the first shift starting at eight in the morning. The Federal regulations restrict all labor to a maximum of 130 hours of work a month with the exception of whirler operators and signal men. Occasionally a trade is exempted when there is a shortage, as carpenters were exempted from the 130-hour limit in May. The limit is eight hours for any one man in a calendar day.

On a project of this size where the labor organization has varied from a minimum of 100 men to a maximum of about 1,000, the need of constant precautions to prevent careless workmen from injuring themselves or others is evident. The Frederick Snare Corp. employs a Safety Foreman whose sole duty is to prevent the many preventable accidents. Evidence of his activity is found in the wide stairs with hand rails giving access to all parts of the work, ladders tied securely to the forms or other structure against which they lean, stretchers at strategic points, fire extinguishers wherever there is danger of fire to an important structure on which

men are working, and clear passages throughout the working area. Of course the careless workman is still in evidence and, with the method of hiring men today and the scarcity of skilled labor, as great pressure cannot be brought to bear on the laborers. The State Compensation Commission which carries the insurance of the contractor has recognized the results of the safety work done by cutting the insurance rate in half since the work at Tygart Dam started.

Personnel

The work at Tygart Dam is under the direct charge of Randall Cremer, Vice President, the Frederick Snare Corp., with C. S. Canals as Resident Engineer, John Pierson as General Superintendent, and J. Manning as Mechanical Superintendent. The project is being built under the direction of the Corps of Engineers, U.S.A., Col. W. E. R. Covell, District Engineer, with Capt. B. C. Fowlkes as Officer in Charge representing the District Engineer, and C. H. Wagner, Resident Engineer.

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C. & E. M. Photo

Rolling a Rock Asphalt Patch

Indiana Does Good Job Maintaining Its Roads

(Continued from page 1)

Upon returning from a heavy grading project south of Indianapolis we met a maintenance crew repairing an old rock asphalt surface and found to our surprise that it was practically impossible to tell when we hit the patches. This called for investigation and we found the reason: careful feathering of the edges and immediate rolling.

After straight-edging the road to determine where the low spots were located, the crew brought up its two trucks, one carrying the tools and towing the Wheeled Roller, and the other carrying the repair material and towing the kettle in which the cut-back was carried.

The first operation was to clean the area of any free dirt and then pour on some cut-back asphalt diluted with gasoline, swabbing the area thoroughly so that every portion of the surface to be covered was "wet" with the cut-back. Then shovelfuls of the finely ground rock asphalt from the truck were spread over the area and luted until the edges were well feathered with the finer material, and the coarser, up to $\frac{1}{4}$ inch, was in the center of the patch. The larger pieces were shoveled up and returned to the truck. Each load of the patching material brought out from the state highway garage where the rock as-

phalt was stored was heated by steam, making it more workable.

The lutes used for spreading the rock asphalt were 30 x 6-inch planks with long handles so that the men could work the material without stepping on it. The front edge of each lute had a piece of iron held firmly by screws to prevent the lute wearing as well as to aid in cutting the material when it is a little high in the patch.

After luting to smoothness the patch was thoroughly rolled with a Wheeled Roller pushed and pulled by the truck. Water from the small tank on the roller was allowed to run over the roll to prevent sticking of the warm material.

The equipment of the crew whose work was observed in particular consisted of two Indiana trucks, a Chausse heating kettle, a Wheeled Roller, and the necessary pouring pots, shovels, lutes and warning signs for traffic. John Flock was Inspector for this unit working out of the highway garage on Indiana Route 46 just east of Bloomington, Ind.

New West Coast Manager For Robert W. Hunt Co.

Frederick S. Cook has been appointed Pacific Coast Manager for Robert W. Hunt Co., Engineers, of Chicago, Ill. Mr. Cook will make his headquarters at 251 Kearny St., San Francisco, Calif. A Columbia University graduate in mining in 1905, he has, since 1919, been Vice President and Secretary of the McCracken-Ripley Co., of Portland, Ore. He is a member of the American Institute of Mining and Metallurgical Engineers and has been active in veteran and other military organizations.

It has been established that approximately 1,000 pounds of explosives are needed to open the way for and to supply crushed stone to every mile of highway constructed in this country, according to the Bulletin of the Institute of Makers of Explosives.

INSLEY TYPE K



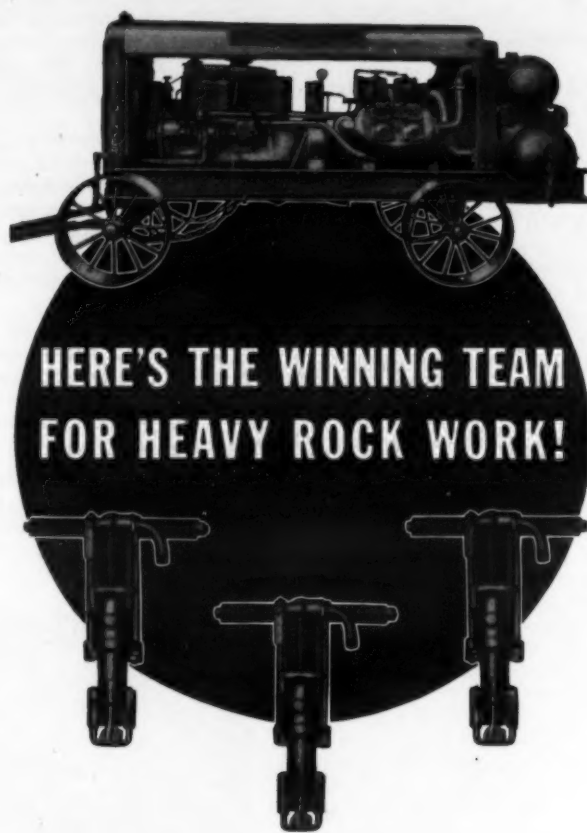
WHERE THE DIGGING IS HARDEST

THE $\frac{3}{8}$ CU. YD. TYPE K INSLEY HAS PROVED TO BE A MOST POWERFUL DIGGER. IT IS WELL BALANCED AND THE STURDY SHOVEL ATTACHMENT MAKES IT SUITABLE FOR THE HARDEST OF WORK

INSLEY MANUFACTURING CORP.

801 N. Olney St.

Indianapolis, Indiana



HERE'S THE WINNING TEAM FOR HEAVY ROCK WORK!

A Gardner-Denver 315' two-stage water-cooled portable compressor, with heavy-duty Buda engine . . . compressor cylinders completely water-jacketed to protect the air supply . . . Timken roller main bearings . . . cushioned valves . . . heavy axle, wheels and drawbar.

PLUS Gardner-Denver S-55 Sinkers—the drills that have done—and are doing—most of the heavy rock excavation in the present construction activity.

GARDNER-DENVER CO., Quincy, Illinois

SINCE 1859



PORTABLE COMPRESSORS THAT PROVIDE MORE AND COOLER AIR—ROCK DRILLS THAT GIVE MORE FOOTAGE PER SHIFT EVERY SHIFT.

GARDNER-DENVER

HERCULES ROAD-ROLLERS

THE ACKNOWLEDGED LEADERS

IRONER ROLL · SCARIFIER · GRADER BLADE
SIZES:—6, 7, 8, 10, 12, 15 TONS

WRITE TO:

THE HERCULES CO.
MARION, OHIO, U. S. A.

Pair of Pavers Push 12-Mile Road Job

(Continued from page 17)

miles to the dual drum paver and about 10 miles to the 27E, there were sixteen trucks running to the dual drum paver and nine to the 27E. These trucks were all hired locally and were Ford V-8 and Chevrolet trucks with dual pneumatic tires.

Expansion Joints

The new beam-type dowel and pre-moulded material expansion joint used in New Jersey was installed throughout this contract. It consisted of twelve channel-section dowels 2 inches deep with a 1/2-inch web and 7/8-inch flange, weighing 4.2 pounds per foot. These dowels were made of steel with a maximum tensile strength of 125,000 pounds per square inch and were machined square at the ends which were covered with a cellular compression material. Angles 9 feet 9 inches long and 1 x 1 x 1/4-inch in size were laid along the face of the Johns-Manville 1/2-inch pre-moulded joint material and in contact with the upper and lower sides of the dowels. The angles were held firmly against the dowels by C-clamps between alternate dowels. Attached to the joint structure was a waterproofing strip of 20-gage galvanized sheet iron dipped in asphalt paint and measuring 9 feet 11 1/2 inches long and with flanges 1 1/2 inches wide turned up at an angle of 45 degrees for 5/16-inch at the end. A protection cap was placed over this during concreting and was removed by the finisher after the finishing machine had made its second trip. This left 5/8-inch above the waterproofing strip which was later poured with bituminous filler. An Aeroil asphalt kettle and pouring pot was used for this purpose.

The design of this new type of joint was described in detail in an article by H. W. Giffin, Engineer of Surveys and Plans, New Jersey State Highway Department, on page 2 of the September, 1936, issue of CONTRACTORS AND ENGINEERS MONTHLY.

The specifications require that all of the channels used as dowels in the expansion joint be coated over the entire surface with a brushed coat of ready-mixed white lead paint and then the entire surface with the exception of the end surfaces and the 7/8-inch top and bottom surfaces are covered with a brushed coat of ready-mixed red lead paint and the entire exposed surface finally covered with a brushed coat of transmission oil. Each coat is required to be at least two days old but not more than thirty days old when the channel is used. The coat of transmission oil is applied after the joint structure is assembled and within one hour of concreting into place.

These specifications necessitated five men in the contractor's yard painting the expansion joint parts. Out on the road the man who oiled the forms also oiled the channels and helped move the hose.

Lubrication

Tydol Veedol lubricants were used throughout on all equipment following the specifications of equipment manu-

facturers as to quality, quantity and frequency of lubrication.

Quantities

Section 3 FAP 130B

Item	Quantity	Unit Price
Length	6 miles	
Contract days	110	
Clearing and grubbing	25 acres	\$125.00
Unclassified excavation	98,732 cubic yards	.25
Wet excavation	6,332 cubic yards	.25
Gravel shoulder	105,316 square yards	.99
Concrete header	115 feet	2.00
Class C conc. culvert walls	9 cubic yards	30.00
Class B concrete culverts	75.5 cubic yards	20.00
Subgrade	64,781 square yards	.07
R.C. pavement 9 inches thick	64,781 square yards	4.00
30-inch C. I. culvert pipe	68 feet	6.00
18-inch C. I. culvert pipe	504 feet	2.50
12-inch corr. metal culvert pipe	227 feet	.60
Borrow	2,827 cubic yards	.35
Contract Price		\$217,395.21

Section 4 FAP 130A

Item	Quantity	Unit Price
Length	6 miles	
Contract days	120	
Unclassified excavation	71,307 cubic yards	.25
Gravel shoulder	97,126 square yards	.10
Class C conc. culvert walls	2.16 cubic yards	35.00
Subgrade	64,149 square yards	.05
R. C. pavement 9 inches thick	27,144 square yards	2.34
24-inch C. I. culvert pipe	72 feet	4.00
18-inch C. I. culvert pipe	276 feet	2.50
Contract Price		\$184,664.66

Personnel

These contracts of S. J. Groves & Sons

of Ridgefield, N.J., were completed under the direction of B. P. Larkin, Resident Manager, with J. B. Mathews, General Superintendent. For the New Jersey

State Highway Department work was under the direction of Department engineers, E. Donald Sterner, State Highway Commissioner.

FRINK SNO-PLOWS



A Size For Every Motor Truck

Manual or Power Hydraulic Control

CARL H. FRINK, Mfr.

Clayton, 1000 Islands, New York

DAVENPORT BESLER CORP., DAVENPORT, IOWA

FRINK SNO-PLOWS OF CAN., LTD., TORONTO, ONT.

SIGNS OF PROGRESS

INSTALLING GOHI PIPE
DETOUR →



Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

WHEREVER GOHI Corrugated Pipe is installed, it is an unmistakable sign of progress. Because GOHI Pure Iron-Copper Alloy has proved to be the longest-lived, low-cost ferrous metal for drainage structures, it insures maximum protection against the destructive action of wear, weather, corrosion, abuse and neglect for the greatest number of years.

Your own highway investment will pay higher dividends in uninterrupted service, freedom from road tie-ups, and costly repairs when you install GOHI Corrugated Pipe Culverts. Get all the facts from the fabricator nearest you.

The Lane Pipe Corporation..... Bath, N. Y.
Dixie Culvert Mfg. Co..... Little Rock, Ark.
St. Paul Corrugating Co..... St. Paul, Minn.
The Newport Culvert Co..... Newport, Ky.
New England Bolt Co..... Everett, Mass.
Central Culvert Co..... Ottumwa, Iowa
Capital City Culvert Co..... Madison, Wis.
F. Yeager Bridge & Culvert Works.... Port Huron, Mich.
Bancroft & Martin Rolling Mills Co... S. Portland, Maine
Denver Steel & Iron Works Co..... Denver, Colo.

(61)

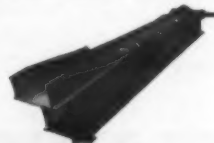
GOHI

PRONOUNCED "GO-HIGH"

CORRUGATED PIPE

GOHI CULVERT MANUFACTURERS, INC., NEWPORT, KY.

Get CLEAN SAND and GRAVEL with EAGLE WASHERS



Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

EAGLE IRON WORKS
DES MOINES, IOWA

New General Utility Roller Is Portable

The Galion general utility roller, weighing up to 8,600 pounds, is designed for the same service as the conventional 5 to 7-ton tandem rollers, according to the manufacturer, the Galion Iron Works & Mfg. Co., Galion, Ohio. It is suitable for rolling all kinds of patch material, highway shoulders, compacting loose material, and similar work, and its easy portability by towing behind a truck makes it particularly adaptable for use by a maintenance crew which moves from job to job along a state or county highway system. When attached to a truck and the roll raised off the ground by means of a hydraulic lift, it can be transported from place to place at truck speed.

Steering of the roller is accomplished by means of a large automotive type steering wheel. Forward and reverse motions are controlled by a single lever, conveniently located. Gear shift and hand brake levers, motor throttle and control rod for the sprinkler valve are all within easy reach of the operator.



C. & E. M. Photo

A Galion Single-Roll Utility Roller Compacting Base Course on a 3.985-Mile Contract South of Provo, Utah, for Which Strong & Grant of Springville, Utah, Was The Contractor

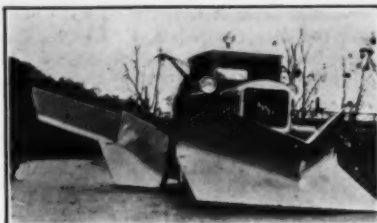
The motor, transmission and compression roll are mounted in a sub-frame hinged at the back to the main frame by a large cross shaft mounted in bronze bushings and supported at the front by a yoke which is attached to the hydraulic ram used for raising and lowering the sub-frame.

Ample size locking pins with retainers are supplied for supporting the sub-frame when raised for towing and the same pins lock the sub-frame to the main frame when the roller is being operated. When the towing tongue is attached to the towing cross-member of the truck and sub-frame raised for towing, ample clearance of from 8 to 9 inches is provided under the compression roll.

The power plant consists of a 4-cylinder motor equipped with air cleaner, magneto with impulse starter, governor and fan. The motor is fully enclosed and protected. Fuel consumption for this power plant for normal rolling conditions is, according to the manufacturer, one half gallon per hour.

A water tank and valve and a sprinkler pipe are provided for keeping the surface of the compression roll wet when rolling material which has a tendency to pick up. The compression roll is of water-tight welded construction to take water up to 2,300 pounds when it is

PERFORMANCE-ACCESSIBILITY



A Norwegian Snow Plow Which Gives Results Similar to Rotaries

A Plow for Snow Breaking

"Snow breaking" is the term used by Norwegians for snow removal operations because the heavy snows create a major highway problem in Norway. In the steep and narrow mountain passes drifts pile high, separating the communities for weeks. The methods used to break open these roads have been studied by experts from all European countries, according to Johnnie Colbjornsen, an equipment dealer at Oslo, Norway.

Mr. Colbjornsen working with a highway engineer has developed a new V-type front-end plow somewhat similar to American design but with a unique wing. The wing is mounted behind the V-plow and is of right-angle shape, with a wide bottom blade and a 3-foot side. Connected to the end of this wing is another, slightly tapered in design but of similar appearance.

With this device, snow which falls to the right of the V-plow is speedily picked up and thrown high and wide over the road, leaving a clean roadway and smooth, sheer banks, similar in appearance to those made by rotary plows.

These plows have been mounted on FWD trucks made by the Four Wheel Drive Auto Co., Clintonville, Wis. for which Mr. Colbjornsen is Norwegian

desired to add additional weight to the roll. Heavy-duty 32 x 6-inch tires are used on the rear wheels. These tires are smooth tread and are designed to give the greatest amount of tread contact area to prevent marking of the material being rolled. Air pressure on the tires can be reduced to cut the contact pressure when rolling soft material.

Complete specifications of this Galion portable roller are contained in Bulletin 194, which may be secured direct from the manufacturer by mentioning this magazine.



Just a few of the 25 Points of Superiority

Helical cut gears—noiseless, long wearing.
Unit car body and machinery table, totally heat treated.
Frictionless bearings thrust.
6 cylinder power.

Drop forged crawler shoes.
Chain crowd with automatic adjustment.
Fast operating speeds.
Safety worm boom hoist.
Separate hoist drums.
Full and enclosing ALL machinery.

TYPES AND SIZES

Capacity	Model
1/4 yd.	20
1/2 yd. (Truck Shovel)	10
3/4 yd. (Tractor Shovel)	30
1 yd.	38
1 1/4 yd.	45
1 1/2 yd.	52
2 yd.	62
2 1/2 yd.	65

The best buy is Bay City

BAY CITY SHOVELS, Inc.
BAY CITY, MICH.

distributor. Six Norwegian counties have these new units powered by FWD trucks and using the Norwegian built plow.

Building of Boulder Dam Depicted in New Booklet

An interesting and well-illustrated booklet, presenting a brief picture-story of the building of Boulder Dam, has recently been issued by The Barrett Co., 40 Rector St., New York City. There are interesting progress photographs of the work, including pictures and information on the use of Barrett roofing, waterproofing and pipe enamels used in the construction of what is generally conceded to be man's greatest engineering achievement.

Copies of this booklet may be secured upon request from The Barrett Co. by mentioning this magazine.

Dirt-Moving Costs Cut To the Bone

WITH a Sauerman Slackline or Drag Scraper you can dig to a depth of several hundred feet, whether in dry ground or under water, and haul the excavated material any distance up to 1500 ft. at a cost of a few cents per cubic yard. Sixteen different sizes with handling capacities from 10 to 600 cu. yds. per hour.



Write for catalog telling all about these money-saving machines.

SAUERMAN BROS.
464 S. Clinton St., CHICAGO

No Diesel can be any better than it's FUEL SYSTEM

Read the record

Ask for booklet FS100

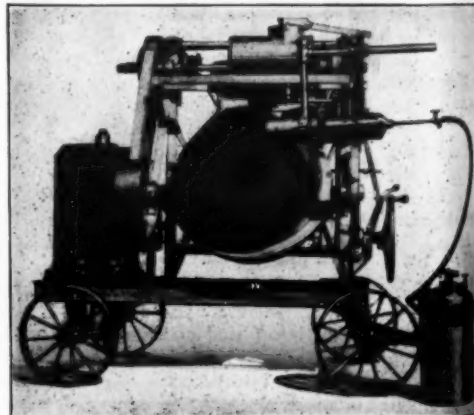
CUMMINS-DIESELS

CUMMINS ENGINE COMPANY, COLUMBUS, IND.

Prepare for Winter



Jacketed oil burning Water Heater that turns out a steady stream of hot water—ideal for outside construction jobs.



Littleford Concrete Heaters with Universal Attachment are made to fit all sizes and types of mixers.

USE Littleford Heating Equipment

You will not have to close down operations this winter if you use Littleford Heating Equipment.

Littleford Concrete Heaters, Water Heaters, Sanderers and Heating Torches provide plenty of heat where you need it.

Write for complete information about these outfits—how and where to use them. You'll be under no obligation.



LITTLEFORD
Road Maintenance Equipment
SINCE 1900

LITTLEFORD BROS., 485 E. PEARL ST. CINCINNATI, O.

Careful Planning For Winter Storms

(Continued from page 23)

arrangement with the school men to take children in rural areas to their homes on notice of a coming snow storm.

When the Storm Comes

On the occasion of a storm, immediate determination of procedure is necessary. There is no need to discuss the routine removal of snow or of surface maintenance following the ordinary snow fall, as this should be cared for automatically if your general preparatory work has been done properly.

But the occasional big storm, when you may anticipate that your resources are to be overtaxed and that there will be unusual hazard to the traveling public, requires special organization.

The time element is a big factor in several ways when a big storm is impending. You can usually anticipate in such case that visibility will be so low that driving even of trucks will be impossible if you have to take a big blow after dark. Your first problem then is to get every person on the roads prior to that time to a safe stopping point. Arrangements with the school men and for public notice work well at such a time, if notice is promptly given.

During the height of the blow, you may or may not be able to maintain some essential part of your system open to traffic. In either case it is essential that powerful units be constantly available for trouble shooting. In our own territory, there are many small communities which are entirely dependent on communication with the cities for medical aid, which requires that these roads be kept open.

All of this must be done without disrupting your snow removal program and with the minimum of fatigue for your personnel, for in one of the big storms the really exhausting grind comes in the last quarter of the storm.

It is essential that your plant and personnel be ready for a quick clean-up of the roads once a storm is beginning to abate. Your determination of procedure at the beginning of a storm should always contemplate this and provide emergency work only as far as is practicable to insure uninterrupted service.

From a paper presented at the Twenty-Second Annual Conference on Highway Engineering, Ann Arbor, Mich.

LAYING BLACK TOP?



JAEGER PAVER has 10 ADVANTAGES:

- 18 Ft. Movable Forms Give Smoothness of Concrete,
- 50% More Traction,
- No Load on New Material,
- Adjustable 9 to 14 Ft. Widths,
- Blends Perfect Joints,
- Capacity to 1000 Tons a Day,
- Lays Hot or Cold Bituminous, Stone or Macadam,
- Pug Mill Spreader,
- Less Hand Finishing,
- Automotive Construction,

Write for New Catalog, Prices.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

JAEGER

Handling Concrete by Pump and Pipeline

The system of placing concrete by pump and pipeline known as Pumpcrete was first introduced in the United States in 1932. Nearly 4,000,000 cubic yards of concrete have been placed by this method in this country, on a wide variety of construction jobs.

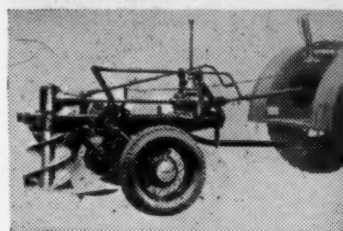
In a booklet "Concrete by Pump and Pipeline" prepared by Charles F. Ball, Chief Engineer, Construction Equipment Division, Chain Belt Co., and published by the American Concrete Institute, appears a discussion of the pump itself, associated equipment, and an enumeration of some of the phenomena of concrete actions in connection with these devices. This discussion is supplemented by tables and illustrations, giving details on mixtures placed by this system and showing how it works.

Copies of this booklet may be secured from the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis.

"Contract Terracing with a

PARSONS WHIRLWIND

is a safe and profitable business"



The Fall is the best season for farm terracing. The fields are clear and the farmers in the best agricultural states are adopting terracing and are eager to get work done.

The United States Department of Agriculture has blazed the trail for you and so eagerly are the farmers adopting the system that they pay "cash" for prompt service.

All they require is "Whirlwind" service which the Parsons field men are ready to supply to you.

An investment of less than \$2000 in wheeled tractor and Parsons Whirlwind can average earnings of \$50.00 per day.

This is the cheapest, fastest and best method of moving earth. Records show costs of less than one cent per cubic yard.

The Farmers Community around you is your field—you can start in as small or large a way as you wish without serious preparatory expense.

Ask your wheeled tractor dealers or write to—

The Parsons Company

Newton,

Iowa

The enthusiasm of both contractors and highway officials for the new Etnyre distributor with the circulating, non-drip spray bar, is remarkable. Their acceptance of Etnyre equipment is evidenced by sales.

Write for descriptive literature



E. D. ETNYRE & CO.

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST.

OREGON, ILL.



The Port-A-Fount Easily Furnishes a Sanitary Drink on the Job

Giving the Water Boy a Sanitary Water Pail

You have been out on a construction job on a hot day and had the water boy periodically offer you a drink from a G.I. pail and a rusty tin dipper which every laborer, healthy and otherwise, and all the rest of the engineers on the job had used. You haven't died from it yet, but you may have had some minor ills from this none too sanitary method of quenching one's thirst.

As a means of providing a clean sanitary drink out on the construction job, the Magnetic Signal Co., 3355 E. Slau-son Ave., Los Angeles, Calif., has developed the Port-A-Fount which is a 3-gallon covered water container with a handle and a short single stroke plunger pump which forces a stream of water from the nozzle at an oblique angle, avoiding possible contamination. An automatic pressure regulator valve limits the flow of water to a convenient drinking position and prevents squirting. A chromium plated guard prevents the drinker from placing his lips in contact with the nozzle. The design of this container prevents any water returning inside.

The sheet metal water container is hot dipped galvanized covered after forming. The sanitary nozzle and guard are made of cast bronze and chromium plated. Other external metal parts are cadmium plated. The entire pump assembly is rigidly attached to the top

Improved Expansion Bolt

A new improved expansion bolt, which is designed to assure holding power up to the breaking point of the bolt, has been developed by the Chicago Expansion Bolt Co., 128 So. Clinton St., Chicago, Ill., by combining the strength of steel and the flowing and gripping properties of lead. Developed for extreme loads, these bolts can not work loose because the anchorage material is lead, a dead metal, which absorbs vibrations, is soft, and does not crush or break down masonry.

The bolt itself is steel and has a thin steel-cone jacket under the bolt head, with a lead jacket on the outside. A washer, slightly larger than the lead

cover which may be removed readily from the water container for cleaning. A screw cap opening allows refilling without removing the cover. The standard Port-A-Fount weighs only 35 pounds when filled with water.

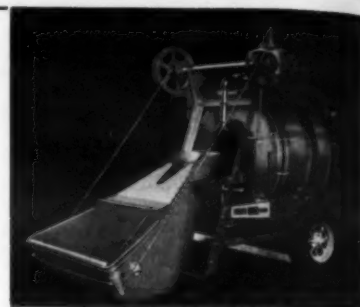
jacket, is furnished to give a good bearing for driving and expanding the lead jacket. It also prevents the lead from backing up into the setting tool, allowing the tool to be removed easily when the bolt is driven.

This bolt, called the Life-Time expansion bolt, is packed in a convenient package with the setting tool and is stocked in sizes of 1/4 to 1/2-inch diameter and 1 1/2 to 8 inches long, finished plain, with cadmium or hot galvanized.

CMC's NEW TWO WHEELERS

Fastest mixing—easiest handling—one and two-baggers in the field. Choice of pneumatic, dual, solid rubber-tired or steel wheels. Spring cushioned—perfectly balanced for "high ball" trailing.

Get bulletin on these new models or other MASTERS and WONDERS from one-half bag to one yard capacity.



CONSTRUCTION MACHINERY CO. WATERLOO, IOWA

25 MILES PER HR. ROAD SPEED with ORDINARY TRUCK ECONOMY

-that's MOBILITY!

In every sense of the word, MICHIGAN is a *MOBILE* power shovel! From the standpoint of speed, economy, convertibility and dependability it has no equal in its size for highway maintenance and for hard use in yard, pit, quarry or construction jobs. Here is *real* truck shovel, crane, drag-line and trench-hoe equipment from the ground up!

Write for new illustrated Bulletin "C"



MICHIGAN POWER SHOVEL COMPANY
Benton Harbor, Michigan U.S.A.

MOVING



HOISTS BODIES TANKS
ROAD SCRAPERS SNOW PLOWS
BOTTLE WASHERS DEHYDRATORS
OIL BURNERS WATER SYSTEMS



Eight cubic yard capacity Heil Dig-N-Carry Scraper moves 78 cubic yards of dirt per hour (325 feet haul each way) at an average cost of FIVE CENTS per cubic yard figuring operating cost of \$4.00 per hour for tractor and scraper. . . . Check YOUR dirt moving costs against this operating performance and figure out for yourself how much YOU can SAVE by using HEIL DIG-N-CARRY HYDRAULIC SCRAPERS. . . . Write or wire for Heil recommendations and prices. . . . Address:

THE HEIL CO.

Factory and General Offices

3000 W. Montana Street

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Branch Factory: Hillside, N.J.—Factory Branches and Distributors everywhere.

MAKE YOUR *Chicago* VISIT A

Real Pleasure

Stay where successful men and women stay—on Michigan Avenue at the Auditorium Hotel where the gallant hospitality of the past meets the modernity of today. Enjoy the fine food,—the large spacious rooms and the

convenience of its "edge of the Loop" location.



AUDITORIUM HOTEL

MICHIGAN AVENUE
AT CONGRESS
STREET

GEO. H. MINK
Manager

RATES
WITH PRIVATE
BATH
\$2.50
WITHOUT PRIVATE
BATH
\$1.50

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Federal Contract Profits Are Taxable

"You owe the State of Oregon \$82,050.28 as excise taxes on the profits you made over a period of four years in constructing the Owyhee dam and irrigation works," blithely remarked the State Tax Commission to a construction company organized under the laws of Washington.

"Oh no," answered the company. "That was a federal job, and you have no right to impose taxes on Uncle Sam's projects."

"But you are not Uncle Sam—not even a relative of his," replied the Commission.

Mutual arguments failing to convince either party, the controversy went to the courts. Holding that the company was liable for the tax, the Oregon Supreme Court said (General Construction Co. v. Fisher, 39 Pac. 358):

"The principle of immunity from state or local taxation of the property and instrumentalities of the United States is generally based upon the direct ownership or use and control of the property by the United States. Such immunity does not extend to the property of an independent contractor for gain, even should it be used in carrying out a contract with the United States. The same principle obtains regarding taxation by the United States of incomes derived by persons and corporations from the state."

Right of Superintendent to Lien for Compensation

A disadvantage in being the "big shot" on a construction job is indicated in an opinion lately rendered by the Wisconsin Supreme Court (Didier v. Kennedy, 246 N. W. 409).

Plaintiff was the executive head in the performance of certain paving contracts for defendant, holding a general power of attorney from the latter. He was to receive \$350 per month, plus 20 per cent of the net profits of the jobs. The salary was paid, but more than \$2,000 was due and unpaid on account of profits.

Plaintiff sought the benefits of Wisconsin statutes which require contractors to give bonds for payment of labor claims, and which make such claims lienable against funds due contractors on municipal jobs. Holding that the statutes did not apply, the court said:

"The plaintiff was not a laborer working upon the job. He was a superintendent in charge of the job under a power of attorney, giving him all of the authority that the contractor himself had. It may be said in addition to that that such manual service as he did perform was fully covered and paid for by the monthly wage agreed upon. The rate of compensation itself would arouse doubt that he was doing the work of a laborer or workman in the ordinary sense. The plaintiff having failed to establish a right to a lien, he has no claim against the defendant city of Beloit, or against the defendant Royal Indemnity Company on its bond."

Liability for Mistakes in Preferring Criminal Charges

If a contractor would minimize the risks of being sued on account of criminal charges being made by his managing employees against third persons, such employees should be clearly instructed just how to proceed where some third person is suspected of forgery or some other crime. Very risky business is it to have people arrested without being almost certain of their guilt.

But a recent decision of the North Carolina Supreme Court (Lamm v. Charles Stores Co., Inc., 159 S. E. 444) is to the effect that an owner of a business is not liable in damages for libel or false arrest committed by a manager unauthorizedly. That was a case where a manager seems to have mistakenly assumed that plaintiff had forged a check, and wrote a letter, and swore out a warrant, charging forgery. Defendant was exonerated from liability for its manager's act under a rule of law stated by the court as follows:

"All the authorities are in agreement that, if the agent, of his own notion, undertakes to set in motion the machinery of the criminal law to avenge an imagined wrong against his employer, such act does not impose liability upon the employer, unless such employer authorized or ratified the conduct of the employee. It is immaterial that the employee intended by such act to secure a benefit for the employer."

TRENCHING MACHINE AT SACRIFICE PRICE

Austin, cuts to depth of 10 ft., 20 to 30" wide. First class operating condition.

Box 134

Contractors & Engineers Monthly
478 Fourth Ave., N. Y.

When One Is Interested on Both Sides of Contract

There are times when a contractor needs legal counsel at his side much more than is necessary under ordinary conditions. One of these times is when he is about to take a contract with a corporation in which he is a controlling stockholder.

An illustration is afforded in the case of Bell v. Fred T. Ley & Co., 179 N. E. 294, decided by the Massachusetts Supreme Judicial Court. There the defendant was interested in a corporation with which it contracted to build a hotel. The court decided that there was nothing to show that the rights of the preferred stockholders of the company were prejudiced, even though the defendant (the contractor) made a profit in building the hotel. The court said:

"A large profit seems to have been made by the defendant, but the recovery of substantial profits by a contractor in and of itself is not ground for setting the contract aside. . . . If the directors of the new corporation, whose conduct must be judged by conditions existing when the contract was made, exercised independent judgment and acted in good faith in the execution of the contract, . . . no wrong was done to the corporation of which it or the preferred stockholders can complain."

Speak Now or Never

"Judge, I ought not to have to pay that paving assessment, because the record of the improvement proceedings is incomplete, failing to show the quality of the paving, unit prices for the work, etc.," complained an abutting property owner in Louisiana when sued on the assessment.

"Did you register any objection while the work was being done," queried the judge.

"No," replied the property owner.

"Then, it is too late to complain now," decided his honor.

We quote below the actual language of the Court of Appeals of Louisiana in this case—City of Shreveport v. Curcio, 157 So. 317:

"In matters of this kind, property owners should not passively stand by and allow unlawful contracts to be executed, or patently improper or faulty material used in the im-

provement in which they are interested; objections or protests should be made at such time that corrections would be effective. . . . When the municipality, through its governing authority, accepts work done under contract with it, and there is a substantial compliance with such contract, in the absence of fraud or material error, the door is closed to individuals to interfere."

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Controlled Application of Lubrication

841 The Alemite systems of lubrication, of which there is one for every lubrication need, and which are designed to control the application of the correct lubricant to the proper amount, is described in a new folder, entitled "The Road to Greater Profits," copies of which may be secured upon request from Alemite Division, Stewart-Warner Corp., Dept. I, 1850 Diversey Parkway, Chicago, Ill.

Vibrators for Concrete Placing

842 Complete details on the various models of Mall concrete vibrators, with gas-engine, air, or electric power units, as well as suggestions as to the best type of vibrator for your particular job, may be secured by writing direct to the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill.

Recirculation Control Feature of Pump

843 A feature of the Marlow self-priming centrifugal pump is the positive recirculation control which prevents waste of power and therefore increases the amount of water pumped and the pump capacity. Complete information on these pumps may be secured direct from Marlow Pumps, Ridgewood, N. J.

Keep Your Wet Jobs Dry

844 The Griffin Jet N' Drive wellpoint systems for keeping wet jobs dry and ahead of schedule are described and illustrated in Catalog A which the Griffin Wellpoint Corp., 60 E. 42nd St., New York City will be glad to send on request.

Motor Trucks for Contractors

845 Complete information on the GMC 3-ton motor truck, or any of the other GMC trucks in larger or smaller sizes, may be secured upon request from the General Motors Truck Co., Pontiac, Mich.

New Machine for Ditching

846 The Parsons Co., Newton, Iowa, will be glad to send to interested contractors and state and county highway engineers complete information on the Parsons Whirlwind, a new portable machine to be used behind any wheeled tractor for terracing, ditching, surface drains and similar work.

Reducing Hauling Costs

847 The Ford Motor Co., Dearborn, Mich., will be glad to have you get in touch with your local Ford dealer to arrange an "on-the-job" test of the Ford V-8 truck, using your own loads and job conditions, to demonstrate the performance and economy claimed for these trucks.

Lighting the Job for Night Work

848 Literature describing the National Carbide V-G light which gives daylight conditions on night jobs, spreads a full even beam of 8,000 candlepower where it is needed, and which will light up the job for 12 hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water, may be secured direct from the National Carbide Corp., Lincoln Bldg., New York City.

Easily-Legible Steel Measuring Tape

849 Complete information on Wyteface measuring tapes, which are easily and accurately read because of the special white surface with black marking, and which are also resistant to kinks and curls, may be secured by contractors and engineers from the Keuffel & Esser Co., Hoboken, N. J.

Pneumatic-Tired Heavy-Duty Trailers

850 C. R. Jahn Co., Funk Bldg., LaCrosse, Wis., will be glad to send on request complete details on its LaCrosse heavy-duty machinery trailers, in 5 to 50-ton capacities, which are equipped with 15-inch wheels and small diameter pneumatic tires.

Complete Line of Pumps

851 Information on any or all of the Novo pumps, diaphragm, pressure, sludge or road pumps, as well as on hoists, pavement breakers, and lighting plants, may be secured by those interested direct from the Novo Engine Co., 216 Porter St., Lansing, Mich.

Rollers for Road Building and Maintenance

852 Complete information on the Buffalo-Springfield road rollers, in a variety of sizes, tandem or three wheel, may be secured by interested contractors, and state and county highway engineers from the Buffalo-Springfield Roller Co., Springfield, Ohio.

High Speed Safety Snow Plows

853 A 4-page leaflet has recently been issued by The Heil Co., 3000 W. Montana St., Milwaukee, Wis., describing and illustrating the Model 1 Gettelman Hi-Speed safety snow plow for mounting on 1½-ton trucks and the Models 2 and 3 Gettelman snow plows for mounting on 2½-ton trucks and up.

Truck-Mounted Compressor

854 The new C-P Utility compressor for truck mounting to provide compressed air on road jobs and similar work, which is mounted crosswise on the truck to leave ample room for hauling men and material, is described in a new folder SP-1953 which the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City, will be glad to send on request.

A Hydraulic Road Scraper

855 The Monarch hydraulic road scraper for use with 1½-ton trucks, features of which are horizontal compression springs with patented blade arm assemblies hinged and locked against lifting, digging and chattering effects, is described and illustrated in a new folder which the Monarch Road Machinery Co., Grand Rapids, Mich., will send on request.

¾ to 15-Cubic Yard Dragline Buckets

856 The Page Automatic dragline bucket, available in sizes from ¾ to 15 cubic yards, for all types of dragline work, is described in a free bulletin which may be secured from the Page Engineering Co., Dept. N, Clearing Post Office, Chicago, Ill.

Handling Materials by Belt Conveyors

857 A new folder entitled "Cutting Costs with Belt Conveyors" describing the Model 347 sectional trough conveyors for handling aggregates and concrete may be secured by those interested direct from the Portable Machinery Co., Div. of A. B. Farquhar Co., Ltd., Box C-1, York, Pa.

New Booklets on Industrial Engines

858 Two new booklets, describing the Cummins line of industrial engines ranging in power from 55 to 200 hp, have just been issued by the Cummins Engine Co., Columbus, Ind. One deals with the many types and applications of these engines and the other describes the fuel injection systems and the difference between the individual pump of the high pressure type and their low pressure distributor type of fuel pump. Copies of these booklets may be secured direct from the Cummins Engine Co., by mentioning this magazine.

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A 3-Speed Hand Winch

859 Complete information on the Ramsey 3-speed all-steel hand winch, with a single line capacity of 5 tons and a drum capacity of 325 feet of 1/2-inch wire rope, may be secured by interested contractors from the Ramsey Machinery Co., Portland, Ore.

Easily-Portable Concrete Mixers

860 Complete information on Ransome "run-about" mixers, in 7-S and 10-S sizes, as well as other concrete equipment, including masts and towers, chuting equipment, pneumatic placers and grouters, may be secured direct from the Ransome Concrete Machinery Co., Dunellen, N. J.

A New Snow Plow Catalog

861 A complete snow plow catalog and handbook, No. 101, has recently been brought out by Good Roads Machinery Corp., Kennett Square, Pa. The book contains 62 pages and shows and explains the several types and 28 various models of Good Roads plows for the winter of 1936-37.

Corrugated Culvert Pipe

862 Full details on Gohi corrugated culvert pipe and its use as culverts for highway protection may be secured by contractors, state and county highway engineers from Gohi Culvert Manufacturers, Inc., Newport, Ky.

Wire Rope for Construction Equipment

863 Catalog and prices on Williamsport Purple Strand Form-Set preformed wire rope, which is designed for long and reliable service, may be secured by those interested direct from the Williamsport Wire Rope Co., 122 So. Michigan Ave., Chicago, Ill.

Clamshell Buckets

864 Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio, will be glad to send on request complete information on the Williams Champion clamshell bucket which it is claimed will handle more yardage per day because of power and less cable overhaul.

A Fast Trailing Mixer

865 Lansing Co., Lansing, Mich., will send on request complete specifications and prices on the Lansing 3 1/2-T portable mixer, features of which are its large mixing drum, Hyatt roller bearing wheels, Alemite fittings and Lauson 2-hp gasoline engine.

Positive-Drive Motor Trucks

866 Descriptive literature on Walter four-point positive-drive trucks which are claimed to offer 100 per cent traction may be secured from Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Queens, L.I., N.Y.

A New Dowel and Joint Support

867 With the Wheeling dowel and joint support, it is claimed that a man can complete a transverse joint in three minutes. Complete information on this one-piece fabricated steel device may be secured direct from the Wheeling Corrugating Co., Wheeling, W. Va.

Subway Methods Used To Build N. Y. Sewer

(Continued from page 13)

the second brace. The distance between the top and second brace varied from 8 to 15 feet, the top braces running parallel to the street surface and the lower braces parallel to the sewer grade.

Wellpoint Dried the Trench

A wellpoint header was placed about 15 feet from the bottom of the trench. The horizontal sheeting from the wellpoint header down was 4-inch and placed at the back of the front flange of the H-beam, thus leaving a 12-inch space through which 2-inch Moretrench wellpoints on 3-foot centers were driven on either side of the trench. An 8-inch Moretrench pump was used to unwater the two lines of wellpoints in a 400-foot section or two 6-inch pumps when the trench was particularly wet.

The excess excavated material not used for backfill was hauled by a fleet of 7 1/2-ton Mack trucks with dual pneumatic tires and dumped on a nearby lot for fill. On the dump the material was spread with a Caterpillar Sixty tractor and LaPlant-Choate bulldozer. The coarse sand excavated at the bottom of the trench ran the gamut of the colors of the rainbow, a somewhat unusual occurrence in this section.

Steel Forms for Sewer

Upon completion of the excavation, the invert of the sewer was poured with concrete delivered in Transit-Mix trucks by the Colonial Sand & Gravel Co. Upon the invert ran a steel inside form furnished by the Koppel Car & Construction Co. The outer form for the concrete sewer was designed on the job and furnished by the Hercules Engineering Co. It runs on one-ton trolleys suspended from 6-inch I-beams by ratchet jacks, the I-beams in turn being fastened to the top line of 12 x 12 cross braces of the trench. The combination of the inner form running on the track and the outer suspended from trolleys made the stripping, shifting and erecting of forms a rapid operation.

Similar Work on Contract 11

Rodgers & Hagerty, Inc., was also the contractor for another section of the Bronx Intercepting Sewer on 133rd Street and Third Avenue and 135th and Exterior Streets. On this work, the same type of construction was used as

on Contract 12 but the excavation was 40 feet deep and the soldier beams were driven 8 feet on center. Moretrench wellpoints were used, set first on the top stringers and then on the second stringers. Excavation in this section was much easier as the trench was coarse sand with a small amount of clay from top to bottom.

Personnel

Contract 11 for 6,325 linear feet of 10-foot x 8-foot concrete sewer in place was awarded to Rodgers & Hagerty, Inc., for \$1,278,000. Contract 12 for 6,675 linear feet of 10 x 8-foot and 10 x 7-foot 6-inch sewer was also awarded to the same contractor for a contract price of \$1,450,000. This contract, which is part of the Ward's Island Sewage Treatment Works, was carried on under the supervision of John J. Hagerty, General Superintendent and Works Manager, with Frank W. Allen, Chief Engineer, David Bonner, Construction Engineer and William Kauffman, Field Engineer. Joseph Rice was Superintendent on Contract 11 and Ed Berglund was Superintendent on Contract 12. For the City

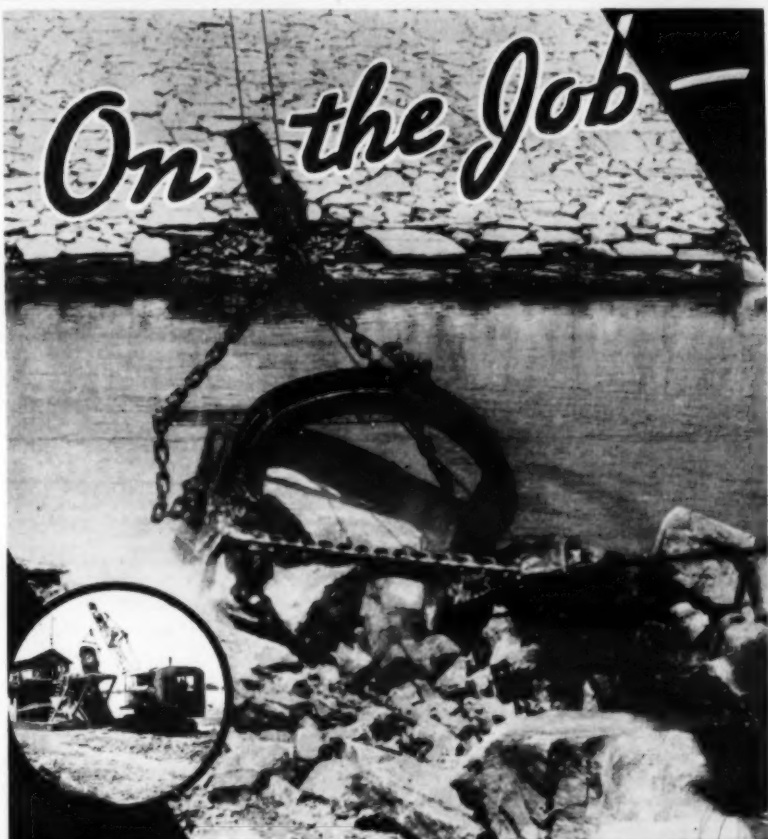
of New York, the project is under the direction of William F. Carey, Commissioner, Department of Sanitation; Walter D. Binger, Deputy Commissioner in charge of engineering and construction; Richard H. Gould, Chief Engineer, Sewage Disposal and Intercepting Sewers; Herbert M. Hale, Engineer of Construction, Ward's Island Project, and Henry Greenburg and Leonard Johnson, Resident Engineers for Contracts 12 and 11, respectively.

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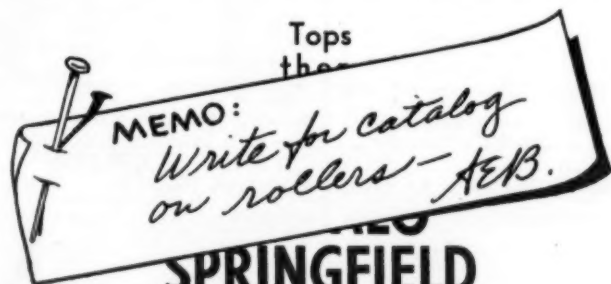
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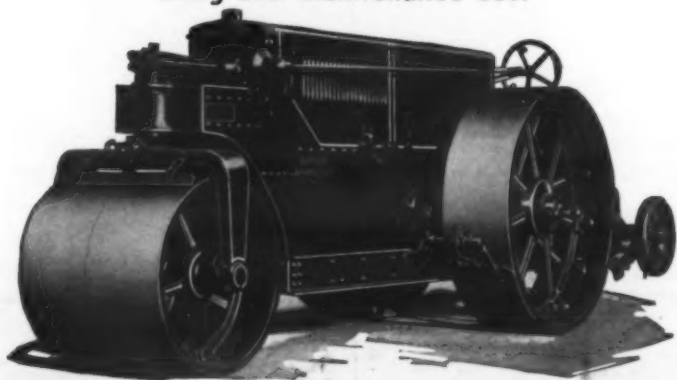
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age in an intermediate type bituminous surfacing. It also would obviate the issuance of further state highway bonds to match Federal Aid funds and part of such an increase, if derived from gas taxes, would go to the counties for use on county aid roads.

Remember the dates of the American Road Builders' Association Convention to be held in New Orleans the week of January 11, 1937.

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F. RONSTADT HARDWARE COMPANY “Pioneers in Good Merchandising” TUCSON ARIZONA BROOKVILLE Locomotives BAY CITY Shovels GALION Graders and Rollers McCORMICK-DEER-ING Industrial and Crawler Tractors McCORMICK-DEER-ING Diesel and Gas Power Units STERLING Hoists STERLING Portable Pumps POMONA Turbine Pumps MYERS Pumps KIMBALL-KROHN Centrifugal Pumps REX Concrete Mixers and Pumps TOLEDO Road Turbines	NORRIS K. DAVIS, INC. 400 Seventh St. San Francisco, Calif. Representing LE ROI CO.—Gasoline Power Units and Parts MINN. STL. & MACHY. CO.—Twin City Engines, parts HANSON CLUTCH & MACHY. CO.—Full Revolving Shovels, Cranes, Draglines, ½, ¾, and 1-yd. KEYSTONE DRILLER COMPANY—Excavating Machines, Shovels, Cranes, Draglines, Full-Scoops, Skimmers, Plunger Shovels, Foremen Breakers DAVIS COMPANY—Large Tilting Mixers, 1, 2, 3, and 4-yd., Weigh Batches, Batching Plants, Manual or Full Automatic Operation, Ready-mix Concrete Plants and Equipment, Motor Truck Concrete Mixers and Carriers, Electrically Operated and Controlled Water Motors, Steel Bins, Bins, Bunkers, Hoppers, Dumper Gates, Chutes O. K. CLUTCH & MACHY. CO.—Hoists & Compressors	R. S. ARMSTRONG & BRO.CO. 676 Marietta St. Atlanta, Ga. Representing ALLIS-CHALMERS Tractors and Road Machinery AMES-BALDWIN-WYOMING BEEBE Hand Hoists BUCHYRUS-ERIE Cranes, Shovels BUTLER Bins, Batches LIDGERWOOD Hoists MCKIERNAN-TERRY Pile Hammers OWEN Buckets SARGEN Derricks and Winches CRUSCA Drill Steel WATERLOO Bar Benders WORTHINGTON Pumps Member: Associated Equipment Distributors	O. T. CHRISTERSON CO. 122 So. Michigan Ave. Chicago, Ill. Representing KOEHRING—Mixers, Pavers, Cranes, Shovels, Dumpers, Mud Jacks KWIK-MIX—Concrete and Bituminous Mixers BLAW-KNOX—Road Forms, Bins, Batches, Finishers LITTLEFORD—Distributors, Tar Kettles, Heaters, Torches GORMAN-RUFF—Self Priming Centrifugal Pumps PARSONS—Trench Machines, Backfillers, Turbo Mixers C. H. & E.—Road Pumps, Saw Rigs, 2-Ton Rollers SPEEDER—Cranes, Shovels, Truck Cranes, ½ yd. HOWA—Crusher Plants, Asphalt Plants R. B.—Power Subgraders, Trailgraders WORTHINGTON—Compressors, Air Tools, Hose CLEVELAND—Subgraders, Straight Edges, Finishers Concrete Carts, Wheelbarrows, Supplies

PEORIA TRACTOR & EQUIPMENT CO.

400 Franklin Street Peoria, Illinois

Representing

Allsteel Products Mfg. Co.
Atchey Truss Wheel Co.
Caterpillar Tractor Co.
Gardner-Denver Co.
Frank G. Hough Co.
Killefer Mfg. Co.
LaPlant-Chaste Mfg. Co.
R. G. LeTourneau, Inc.
Speeder Machinery Corp.
Willamette-Hyster Co.
Universal Crusher Company

Telephone 6177

FLETCHER EQUIP. CO., INC.

309 Magazine Street New Orleans, La.

Representing

ARCHER Towers and Chuting Equipment
BUTLER Bins, Batches
CLYDE Hoisting Engines and Derricks
FREEMAN Turntables
GALION Graders, Rollers
LE ROI-RIX Portable Air Compressors
LE ROI Gas Engines
LINK-BELT Draglines, Cranes and Shovels
LITTLEFORD Heaters, Kettles

M & W Form Clamps
OWEN Clamshell Buckets
OMAHA Dragline Buckets
REX Mixers, Pavers, Pumps and Saw Rigs
SAUERMAN Cableway Excavators
STERLING Wheelbarrows and Carts
SIMPLEX Trench Braces and Jacks
TOLEDO Turches
WOOD Molybdenum Block Shovels

Member: Associated Equipment Distributors

HEDGE & MATTHEIS CO.

285 DORCHESTER AVE. BOSTON, MASS.

Representing

Providence, R.I.; Portland, Me.; Hartford, New Haven, Conn.; Springfield, Worcester, Mass.; Concord, N.H.

Acme Road Machy. Co.
Aeroli Burner Co.
Byers Machine Co.
Chicago Automatic Conveyor Co.
Amer. Tubular Elevator Co.
Electric Taper & E. Co.
Erie Steel & Constr. Co.
Four-Wheel Drive Sales Co.
Frank, Carl
Huber Mfg. Co.
Ingersoll-Rand Co.
Ingersoll-Rand Co.
Jager Machine Co.
Jones Superior Machine Co.

A. Leachon & Sons Rope Co.
Lima Locomotive Wks., Inc.
Shovel & Crane Division
Lima Manufacturing Corp.
McKernan-Terry Corp. and Lambert-Nat'l Hoist Div.
Nebraska Bridge Supply & Lumber Co.
Parsons Co.
Red Star Products Co.
Sagons Derrick Co.
Toledo Pressed Steel Co.
Yale Co.
Wood Shovel & Tool Co.

Member: Associated Equipment Distributors

BORCHERT-INGERSOLL, INC.

St. Paul, Minn. Duluth, Minn.

Representing

Allis-Chalmers Tractors and Graders
"American" Bulldozers
Snow Plows
Blaw-Knox Bins, Forms, Buckets, Finishes
B-B Hand Hoists
Clyde Hoists, Derricks
Cleveland Formgraders
Diamond Crushers, Screens
Domestic Pumps
Eustis Wagons, Scrapers
Gopher Road Signs
Hais Loaders
Hercules Road Rollers

Hough-Universal Sweeper
Koppel Industrial Cars
McKernan-Terry Pile Hammers, Extractors
M-W Lubricants
Michigan Power Shovel
Northern Conveyor
Northwest Shovels, Cranes
Oshkosh 4-wheeled Dr. Trucks
"RB" Power Subgraders
Smith Mixers, Pavers
Sullivan Compressors, Tools
Tore Highway Mowers
Whitecomb Locomotives

Member: Associated Equipment Distributors

INDIANA EQUIP. CO., INC.

327-329 West Market St., Indianapolis, Ind.

Representing

ATHEY TRUSS—Wagons, Bulldozers
BUFFALO-SPRINGFIELD—Rollers
"CATERPILLAR"—Road Machinery
"CATERPILLAR"—Tractors
INGERSOLL-RAND—Compressors, Tools
LA PLANT-CHASTE—Wagons, Scrapers, Bulldozers
LE TOURNEAU—Scrapers, Buggies, Bulldozers

OWEN—Clam Shell Buckets
PAGE—Dragline Buckets
SAUERMAN—Cableways, Power Scrapers
UNIVERSAL—Crushers, Pulverizers
THEW—Shovels, Draglines
TYLER—NIAGARA—Vibrating Screens

Member: Associated Equipment Distributors

ALBAN TRACTOR CO., INC.

725-27 East 25th St. Baltimore, Md.

Representing

"CATERPILLAR" Diesel Tractors, Motors
"CATERPILLAR" Road Machinery
"CATERPILLAR" Combine Harvesters
GENERAL Excavators
GRAVELLY Power Mowers, Plovers
KILLEFER Tillage Tools
LINK-BELT Shovels & Cranes
LA PLANT-CHASTE MFG. CO.
BARCOCK MFG. CO.
WILLAMETTE-HYSTER CO.
BAKER MANUFACTURING CO.
ROTARY SNOW PLOW CO.
ATHEY TRUSS WHEEL CO.
REX-WATSON CORPORATION
BLAW-KNOX Bulldozers, Dirtmovers
HOMESTEAD Hypressure Jenny Cleaners
HARRON-HERRINGTON All-Wheel Drive Trucks
GARDNER-DENVER CO.

Member: Associated Equipment Distributors

THOMAS G. ABRAMS, INC.

Construction Equipment 2411 Fourteenth St. Detroit, Mich.

Representing

Aeroli Burner Co.
Archer Iron Works
Brookville Locomotive Co.
McCormick-Deering Power
Butler Bin Company
Burch Corporation
Byers Machine Co.
Domestic Engine & Pump Co.
LeROI-Rix Compressors
Sagons Derrick Company
T. L. Smith Company
Smith Engineering Works
Sterling Wheelbarrow Co.
Toledo Pressed Steel Co.
Bates Valve Bag Corp. (Bates Wire Ties)

Member: Associated Equipment Distributors

E. A. MARTIN MACHINERY CO.

Joplin, Mo. Springfield, Mo. Harrison, Ark.

Representing

Athey Truss Wheel Co.
Caterpillar Tractor Co.
Killefer Manufacturing Co.
LaPlant-Chaste Manufacturing Co.
R. G. LeTourneau, Inc.
Schramm, Inc.
Speeder Machinery Corp.
Anthony Co., Inc.
Willamette-Hyster Co.

Member: Associated Equipment Distributors

GIERKE-ROBINSON CO.

4th & Ripley Sts. Davenport, Iowa

Representing

BLAW-KNOX—Steel Road, Curb and Gutter Forms, Bins, Batches, Clamshell Buckets, Truck Turntables, Ord Concrete Road Finishers
CHAIN BELT—Mixers, Pavers, Pumps, Saw Rigs, Conveyors, Elevators
CLYDE—Gasoline and Steam Hoists, Derricks
HOUGH-UNIVERSAL—Sweepers
SULLIVAN—Air Compressors, Tools
THACKSON—Crawlers, Shovels and Bulldozers
THEW-LORAIN—Cranes, Shovels, Draglines
TIMKEN—Detachable Rock Bits, Steels
UNIVERSAL—Truck Cranes
UNIVERSAL—Form Clamps

Member: Associated Equipment Distributors

D. C. ELPHINSTONE, INC.

115 S. Calvert St. Baltimore, Md. 976 Nat'l Press Bldg., Washington, D. C.

Representing

Koeberling Co.
Kwik-Mix Co.
Insley Mfg. Co.
Parsons Co.
Geo. Hais Mfg. Co.
Sauerman Bros. Inc.
Allis-Chalmers Mfg. Co.
Werthington Pump & Machy. Corp.
Linn Mfg. Corp.
Owen Bucket Co.
LaBour Co., Inc.
Emerson Pump & Valve Co.
Iowa Mfg. Co.
Erie Steel Constr. Co.

H. K. Porter Co.
Road-Prentice Corp.
Trucon Steel Co.
McKernan-Terry Corp.
Lambert-National Hoists
Goddard Rubber Co.
Minwax Co.
E. D. Etnyre & Co.
W. A. Riddell Co.
Hough-Universal Sweepers
Griffin Wellpoint Corp.
Huber Mfg. Co.
Vibor Co., Ltd.
Wheeler Roller Corp.
Universal Form Clamp Co.

Member: Associated Equipment Distributors

KELLER TRACTOR & EQ. CO., Inc.

5163-69 Martin Ave., Detroit, Mich.

Representing

Ateco—Dirt-moving equipment and bulldozers
Blaw-Knox—Snow plows, road machinery
Blaw-Knox Company—Finishing machines, road forms, bins, batches and buckets
Bucyrus-Erie Company—Shovels, cranes, draglines
Chain Belt Co.—Mixers, pavers, pumps
Caterpillar Tractor Co.—Tractors, graders, road machinery
D-A Lubricant Co.—Lubricants
Dittler Mfg. Co.—Hercules spreaders
Gardner-Denver Co.—Air compressors and tools
Killefer Mfg. Corp.—Road and farm tools
LaPlant-Chaste Mfg. Co.—Bulldozers, backhoes, wagons, snow plows
A. Leachon & Sons Rope Co.—Wire rope
R. G. LeTourneau, Inc.—Dirt moving, road equipment
E. D. Etnyre & Co.—Oil and tar distributors and heaters
Timken—Rock bits
Universal Crusher Co.—Gravel Equipment

Member: Associated Equipment Distributors

BUBLITZ MACHINERY CO.

2141 Washington St., Kansas City, Mo.

Representing

Jager Machine Co.
Lakewood Engineering Co.
The Shovel Co.
Barber-Greene Company
Iowa Manufacturing Co.
McKernan-Terry Corp.
Whitecomb Locomotive Co.
Butler Bin Co.
"Williams"—Buckets and Trailers
Blusser-McLean Scraper Co.
Ames Baldwin Wyoming Co.
MacWhyrte Co.
Red Star Products Co.
Sagons Derrick Co.
Climax Engineering Co.
Schramm, Inc.

Member: Associated Equipment Distributors

THOMAS L. BARRET

112-114 So. Second St., Louisville, Kentucky

Representing

C. H. & E. Road Pumps, Hoists, Saws
RUSSELL Scrapers, Drags, Plovers
KNICKERBOCKER Concrete Mixers
BAY CITY Shovels and Cranes
BETHLEHEM Reinforcing Bars

PIONEER Crack and Joint Filler
KENNEDY Crushers, Screens, Elevators
LEROI High Efficiency Air Compressors
BARRET Asphalt Expansion Joint
LACROSSE Two-Way Machinery Trailers
HERCULES Road Rollers

Member: Associated Equipment Distributors

JOHN C. LOUIS COMPANY

511 W. Pratt St. Baltimore, Md.

Representing

JAGER—Concrete Mixers, Pumps, Truck Mixers, etc.
LAKEWOOD—Finishers, Forms, Towers
AMERICAN CABLE—Tru-Lay Wire Rope
NORTHWEST—Cranes, Shovels, Draglines
BUTLER—Bins
CENTAUR—Road Mowers
ADAMS—Leaning-Wheel Cranes
ALABAMA—Cast Iron Pipe

WHEELING—Corrugated Culvert Pipe
GOOD ROADS—Crushers
LITTLEFORD—Asphalt Heater, Distributors
BURCH—Spreaders
JONES—Saw Rigs
GENERAL—Wheelbarrows
TIMKEN—Detachable Rock Bits
HILYARD-NEWBOLD—Hot or Cold Asphalt Mixing Plants

Member: Associated Equipment Distributors

CONTRACTORS MACHY. CO.

530 Monroe Ave., N.W. Grand Rapids, Mich.

Representing

Jager Machine Company
Lakewood Engineering Co.
Northwest Engineering Co.
Sullivan Machinery Co.
Pioneer Gravel Equipment Mfg. Co.
Butler Bin Company
Clyde Sales Company
Gallen Iron Works
Pine Engineering Co.
American Steel & Wire Co.
Burch Corporation
Ross Snow Plows
Sagons Derrick Company
Sauerman Brothers

Syston Company
LeROI Company
Aeroli Burner Company
Conner & Company
Jones-Superior Company
Meritz-Bennett Company
Ames Shovels
Rowe Manufacturing Co.
Red Top Steel Post Company
Toledo Pressed Steel Co.
Bates Wire Ties
Electric Taper & Equip. Co.
Sterling Wheelbarrows
Trackson Co.

Member: Associated Equipment Distributors

O. B. AVERY COMPANY

1325 Macklind Avenue St. Louis, Mo.

Exclusive Distributors for

American Steel Works
Austin-Western Road Machinery Co.
Blaw-Knox Co.
Chain Belt Co.
Dayton Sore Grip & Shere Co.
C. N. John Co.
Kewanee Machinery & Conveyor Co.
Kob Manufacturing Co.
McKernan-Terry Corp.
Northwest Engineering Co.
MUNSGOOD CORP.—Sandblast Equipment
Sullivan Machinery Co.
Vulcan Locomotive Works
Koppel Industrial Car & Equip. Co.
Barco Mfg. Co.

Member: Associated Equipment Distributors

WE WOULD LIKE TO HAVE YOU HELP US

make this Directory of Dealers in construction equipment the most complete and accurate of its kind. Therefore, we would greatly appreciate any suggestions or corrections that you may have to offer.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Avenue New York

HENRY A. PETTER SUPPLY COMPANY

Paducah Kentucky

Representing

Allsteel Equipment
American Wire Rope, Mesh
Bates Bar Ties
Bates Tractors
Blaw-Knox Hoists
Black & Decker Tools
Cedar Rapids Crushers
Chain Belt (Box) Mixers
D-A Lubricants
DuPont Explosives
Dodge Derricks
Elastic Expansion Joint
Eustis Scrapers
Farquhar Engines, Boilers
General Electric Motors
Gulf States Reinforcing
Hais Hoists
Hais Hoisters and Thawers
Johns Bins and Hoppers

LeROI Gas Engines
Lidgerwood Hoisting Machy.
Link-Belt Cranes, Shovels
New Pumps and Hoists
Oxwell Apparatus
Page Buckets
Portable Conveying Machinery
Rogers Bros. Trailers
Sagons Derricks
Sauerman Scrapers
Shank Grader Blades
Telsco Torches
Trackam Tractors
Universal Concr. Accessories
Vulcan Pile Equipment
Wells Graders
Western Road Machinery
Werthington Pumps
Wyoming Shovels

Member: Associated Equipment Distributors

CLARK-WILCOX COMPANY

790-798 Albany St. Boston, Mass.

Representing

RANSOME—Concrete Mixers, Chuting Equip.
NORTHWEST—Cranes, Shovels, Draglines
BLAW-KNOX—Steel Forms, Bins, Buckets, "Ord" Finishers
CARTER—"Humdinger" Pumps
INGERSOLL-RAND—Air Compressors
ORR-SENBOWER—Hoists, Boilers, Mixers
HAUCK—Oil Burners and Heaters
HAIS—Elevators, Conveyors and Loaders
ALLIS-CHALMERS—Tractors
BAKER—Bulldozers
BEEBE—Hoists
CLEVELAND—Formgraders
C. R. JAHN CO.—Trailers
BURCH—Box Plovers, Road Machinery
HOMESTEAD—Hypressure Jenny Cleaner
C. H. & E.—Pumps, Saw Tables, Hoists
PIERCE—Rollers
MICHIGAN—Shovels
COMPLETE—Wellpoints
HYKINS—Tractorhoes
BLYSTONE—Mortar Mixers

Member: Associated Equipment Distributors

LANGE TRACTOR & EQ. CO.

304 Lake Ave., S. Duluth, Minn.

Representing

Aeroli Tar Kettles, Heaters
Caterpillar Road Machinery
LaPlant-Chaste Wagons, Bulldozers, Snow Plovers, Scrapers
Keystone Excavators, Blast Hole Drills
Diamond Gravel Crushing, Screening, Washing
Plants, Conveyors
Killefer Scrapers, Road Discs, Rippers
Dancy Air Compressors
Cleveland Rock Drills
Lambert Wagons
Ames Baldwin Wyoming Hand Shovels

Blaw-Knox Atco Scrapers, Bulldozers
Hansen Gas Shovels, Trills
Willamette-Hyster Hoists and Winches
Wausau Tractor and Truck Snow Plovers
Davenport Gas and Diesel Locomotives
Oshkosh 4-Wheel Drive Trucks
Anthony Power Loaders
Loach Concrete Mixers
MacWhyrte Wire Ropes
Hercules Earth Boring Machines
LeTourneau Concr. Equip.
Speeder Shovels

Member: Associated Equipment Distributors

CORBY SUPPLY COMPANY

3942-46 W. Pine Blvd., St. Louis, Mo.

Representing

AMERICAN—Flexible Metal Hose
BUHL CO.—Portable Air Compressors
CHAMPION RIVER CO.—Bridges and Welding Rod
DETROIT HOIST & MACH. CO.—Air and Electric Hoists
DAVIDS CO.—Paint Spray Equipment
HARDGOG WONDER DRILL CO.—Rock Drills and Paving Breakers
W. H. KELLER, INC.—Super Pneumatic Tools
L. B. L.—Air-Operated Concrete Vibrators
PANGBORN CORP.—Sandblast Equipment
PENNSYLVANIA—Air Compressors and Pumps
DAVID ROUN & SON—Chain Hoists
STAYNEW—Air and Pipeline Filtr
N. A. STRAND CO.—Flexible Shaft Equipment
VAN DORN—Electric Drills, Grinders and Buffers
VICTOR—Welding and Cutting Apparatus
WESTINGHOUSE—Arc Welding Equipment
GUSTAV WIEDEKE CO.—Tube Expanders

Member: Associated Equipment Distributors

Equitable Equipment Co., Inc.

410 Camp Street New Orleans, La.

Representing

BROWNING Cranes and Shovels
CAMERON Pumps
CEMENT GUN Gunting and Equipment
CUMMINS Diesel Engines
DEAN BROS. Steam and Power Pumps
GENERAL ELECTRIC Motors, Arc Welders, etc.
GRUNDLER—Crushing, Pulp Machy.
HYDROLI Goshals Oil Purifiers
INGERSOLL-RAND Air Compressors, Prod. Tools, Pumps, Engines
MERRELL Pipe Machines

MOORE Steam Turbines, Reduction Gears
MORRIS Dredging Machy.
MUNDY Hoisting Engines
NOVO Engines, Hoists, Pumps
PLYMOUTH Gas and Diesel Locomotives
RANNEY Winches, Hoists
SHAW BOK Hoists, Cranes
SMITH Concrete Mixers
TROY-ENGERS Generators, Steam Engines
WEIR-KILBY Frost and Belts
WELDED Tanks, Pipe Barges, Pontons
WELDON Rods and Equipment

Member: Associated Equipment Distributors

THE EQUIPMENT CO.

30 Prentiss St. Boston, Mass.

Representing

Link-Belt Cranes and Shovels
Ingersoll-Rand Compressors and Tools
"Williams" Buckets and Trailers
Homelite Pumps and Generators
COMPLETE RENTAL SERVICE

Member: Associated Equipment Distributors

WM. H. ZIEGLER CO., INC.

Minneapolis, St. Paul, Duluth, Crookston, Minn.; Glasgow, Mont.

Representing

"CATERPILLAR"—Tractors, Engines, Road Machinery
LA PLANT-CHASTE—Bulldozers, Snow Plovers, Dump Wagons
LA TOURNEAU—Dirt Moving Road Equipment
KILLEFER—Road Rippers, Scrapers
ATHEY—Crawlers, Dump Wagons, Trailers
BUCYRUS-ERIE—Power Shovels, Cranes, Draglines
PIONEER—Crushers, Gravel Plants
REX—Mixers, Pavers, Motor-Mixers, Pumps, Saw Rigs
BUTLER—Bins, Batches

BARBER-GREENE—Conveyors, Loaders, Ditchers
F. W. D.—Four-Wheel Drive Trucks
PLYMOUTH—Locomotives
GARDNER-DENVER—Air Compressors, Drills
LAPER TRAILMOBILE—Semi-Trailers
LEACHEN—Wire Rope
BLAW-KNOX—Madison Asphalt Plants, Atco Scrapers
LITTLEFORD—Oil Distributors, Tar Kettles, Heaters
"WILLIAMS"—Buckets, Heavy-Duty Trailers
HYPERBAUR JENNY—Spray Cleaners

Member: Associated Equipment Distributors

JOHN FABICK TRACTOR CO.

Gravois & Iowa Aves. St. Louis, Mo.

Representing

Athey Truss Wheel Co.
Cleveland Rock Drill Co.
Blaw-Knox Company
Caterpillar Tractor Co.
Davy Compressor Co.
Euclid Road Machinery Co.
Killefer Mfg. Co.
LaPlant-Chaste Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
The Shovel Company
Willamette-Hyster Co.
W. K. LeTourneau, Inc.
Ramsey Machinery Co.

Member: Associated Equipment Distributors

JOSEPH KESL TRACTOR & EQUIP. CO.

1510 North 13th St. St. Louis, Mo.

Representing

Allis-Chalmers Mfg. Co.
American Steel Shovel & Wheelbarrow Co.
The Baker Mfg. Co.
Continental Roll & Steel Foundry Co.
Wm. Bros. Boiler & Equip. Co.
Erie Steel Construction Co.
Gardner-Denver Co.
General Wheelbarrow Co.
Lyle Sign, Inc.
Toledo Pressed Steel Co.
Aeroli Burner Co., Inc.
Contractors Machinery Corp.
Domestic Engine & Pump Co.
Diamond Iron Works, Inc.
Orr & Sombower, Inc.
Pocyrus-Erie Co.
Construction Machy. Co.
Fairbanks, Morse & Co.

Member: Associated Equipment Distributors

C. F. RABBEIT, INC.

1523 N. Broadway St. Louis, Mo.

Representing

C. H. & E. Mfg. Co. Littlefield Bros.
Cleveland Formgrader Co. Parsons Co.
Cleaver-Brooks Co. Union Iron Works, Inc.
Huber Mfg. Co. Butler Bldg. Co.
Insley Mfg. Co. Frank G. Hough Co.
Koching Co. Metal Form Corp.
Kwik-Mix Mixer Co. Therman W. Rosholt Co.
Lidgerwood Mfg. Co. Sterling Machinery Corp.

Member: Associated Equipment Distributors

THE GEO. F. SMITH CO.Franklin & Channing Aves., St. Louis, Mo.
Complete Plants Rented

Ingersoll-Rand Compressors, Air Tools
Clyde-Holts and Derricks
Grove-Clamshell Buckets
Hauk-Hesters
Sageen-Derricks & Winches
Skilaw-Electric Saws
Drills
Skellon-Shovels
Skelton-Holts and Derricks
Symons-Colum Clamps
Winlow-Weighing Scales
Universal-Form Clamps
Link-Belt-Cranes, Shovels, Draglines
Nove-Pumps

Member: Associated Equipment Distributors

CONNELLY MACHINERY CO.

509 No. 27th St. 315 2nd Street So. Billings, Mont. Great Falls, Mont.

Distributors of

Caterpillar Tractors, Engines, Road Machinery
Pioneer Gravel Plant Equip.
Bucyrus-Erie Shovels, Draglines and Cranes
Bucyrus-Erie Loadmasters
Buckeye Ditchers, Backfillers
Buffalo-Springfield Road Rollers
D-A Lubricants, Oils
Hewitt Belting, Hose
Tractor-operated Hoists, Scrapers, Dirtmovers, Rippers, Scarifiers, Bulldozers, Trailbuilders, Backfillers, Snow Plows, Loaders, Track-type and Wheeled Wagons and Trailers, etc.

Member: Associated Equipment Distributors

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802-12 E. Iron St., Butte, Mont.

Representing

American Cable Co. Hanson Trailers
Atlas Imp. Diesel Eng. Co. Hazard Wire Rope Co.
Butler Bldg. Co. Madison Iron Works
Chain Belt Co. Marmes-Harrington Co.
Cleaver-Brooks Co. Mohawk Asphalt Heater Co.
Coffing Hoist Co. New Engine Co.
Columbia Steel Casting Co. Ohio Valley Pulley Works
E. D. Elyre & Co., Inc. Portable Machinery Co.
Elgin Corporation Ramsey Winches
Euclid Road Machy. Co. Rotary Snow Plow Co.
Feble Company Sauerman Bros., Inc.
Galton Iron Wks. & Mfg. Co. The Wheel Company
Gardner-Denver Co. Tinkon Roller Bearing Co.
Gardner-Tire & Rubber Co. Willott Mfg. Co.
Jos. F. Kliestler Co.

Member: Associated Equipment Distributors

NORTHWEST EQUIP. CO., Inc.

Box 1112 Great Falls, Mont.

Complete Line of Road Machinery and Contractors' Equipment

Representing

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KOEHRING Mixers, Pavers, Shovels OWEN Buckets
INSLEY Concr. Towers SCHRAMM Air Compressors
PARSONS Ditchers MacWHYTE Hoops
PANTHER Oil, Grease CLEVELAND Rock Drills

Steel Bridges and Traffic Trusses, Frames, Plows, Scrapers, etc.

HEYNIGER BROTHERS

6th Ave. and F St. Belmar, N. J.

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JAEGER Concrete Mixers
JAEGER Placing Plants
AEROIL Torches, Heaters

Steel Sidewalk and Curb Forms
"Mud Hog" Pumps
Material Elevators
Air Compressors
Gasoline Hoists
Trench Pumps
Carbic Lights

DALE & RANKIN, INC.

113 Frelinghuysen Ave., Newark, N. J.

Representing

HELTZEL Road Forms and Bins
P & H Cranes and Excavating Equipment
INGERSOLL-RAND Compressors and Tools
STERLING Wheelbarrows
AEROIL Heaters and Tools
ALEMITE Guns and Fittings
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REX Saw Rigs
UNIVERSAL Concrete Accessories
VIBER Elec. & Pne. Concrete Vibrators
WINSLOW Scales

Member: Associated Equipment Distributors

JOHNSON & DEALAMAN, INC.

60 Marshall Street Newark, N. J.

Representing

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SCHRAMM Air Compressors, Tools
ALLIS-CHALMERS Tractors, Graders
JOHNSON Steel Bins and Batches
ERIE Gasoline Rollers
MARLOW Centrifugal, Diaphragm and Plunger Pumps
ETWYRE Tar and Asphalt Distributors
WILLIAMS Trailers and Buckets
RED STAR Wheelbarrows, Batch Boxes, Column Clamps and Adjustable Shores
OSGOOD Shovels, Cranes and Draglines
GENERAL Shovels, Cranes and Draglines
HOTCHKISS Road and Sidewalk Forms
VIBRO-CAST & JACKSON Concrete Vibrators and Elec. Power Plants
AMERICAN Snow Plows
HY-WAY Spreaders

CONTRACTORS WHITE SALES CORP.

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Representing

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and Buses Baker Mfg. Co., Inc.
Allis-Chalmers Mfg. Co.—Huber Mfg. Co.
Tractors, Road Machy. Hough Universal Sweepers
Jaeger Machine Co. Main Steel Products Co.
General Excavator Co. Pioneer Gravel Eq. Mfg. Co.

DOW & COMPANY, INC.

Court & Wilkeson Sts., Buffalo, N.Y.

Exclusive Distributors of

ADAMS—Leaning Wheel Graders
BARCO—Gasoline Hammers
BURCH—Spreaders, Maintainers, etc.
C. H. & E.—Pumps, Hoists, Saw Rigs
CHICAGO PNEUMATIC TOOL CO.—Compressors, Drills
EUCUID—Earth-Moving Equipment
FRANK—Saw Pumps
HOUGH UNIVERSAL—Sweepers
McCOMICK-DEERING—Tractors
"METAFORMS"—Concrete Forms
MOHAWK—"Hotshot" Kettles, Burners
T. L. SMITH—Mixers, Pavers, Tower Pavers
THE LORAIN—Shovels, Cranes
TORCAN—Corrugated Culverts
UNIVERSAL-LORAIN—Shovels, Truck Cranes
WALTER—Snowplows, Tractor Trucks
"WILLIAMS"—Buckets, Trailers
WILLIAMS—Wire Rope

Member: Associated Equipment Distributors

LLOYD G. ROSS

3090 Main St. Buffalo, N. Y.

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General Excavator Co.
Hercules Roller Co.

Sale and Rent of All Kinds of Construction Equipment

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116 John Street Horseheads, N. Y.

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A-W—Traffic Tread
BAKER—Road Drags, Snow Plows
C. M. C.—Wender & Marsh-Capron Mixers
HUBER—Rollers
HOTCHKISS—Sidewalk Forms
HANSON—Excavators
INGERSOLL-RAND—Air Compressors
JACKSON—Wheelbarrows
MILES—Concrete Block Machines
THE NORTHERN—Gravel & Coal Conveyors
WILLIAMS—Wire Rope
WISCONSIN SPECIAL—Snow Plows

GEORGE MALVESE & CO.

New Hyde Park, N. Y.

Long Island Distributors:

CLETRAC Crawler Tractors
"SILVER KING" Tractors
ADAMS Graders
SARGENT Snow Plows
WORTHINGTON Power Mowers
LOCKE Power Mowers
REX Pumps, Mixers
EUCUID Scrapers
OLIVER Implements
BRODERICK & BASCOM Wire Rope

*"Brooks for Concrete Equipment"***R. E. BROOKS COMPANY**Equipment for Contractors
50 Church Street New York, N.Y.

Blaw-Knox Co.—Road and Sidewalk Forms, Bins, Batches, Finishing Machines, Spreaders, Buckets
Cleaver-Brooks Co.—"OILBILT" Boilers, Tank Car Heaters
Insley Mfg. Co.—Excavators, Concrete Chuting Plants, Buckets, Cars
Koching Company—Pavers, Mixers, Shovels, Cranes
Kwik-Mix Mfg. Co.—Concr. Mixers
Master Vibrator Co.—Concr. Vibrators
Parsons Co.—Trench Machines
Rosen Mfg. Co.—Oil Distributors

A. P. DIENST CO., Inc.Contractors' Supplies
140th St. & 3rd Ave., New York, N. Y.

Distributors for
GRETAG Grease
TOLEDO Bull Frog Wheelbarrows
WYOMING Red Edge Shovels
DUFF Sewer Trench Braces
CURRY Wire Ties
KEYSTONE Grease

Telephone Mott Haven 9-5430

MAHONEY-CLARKE, INC.Complete Line of Contractors' Equipment and Supplies.
217 Pearl Street New York, N.Y.

Hiddell Graders
Hercules Road Rollers
Schramm Compressors
Marlow Self-Priming Pumps
Munsell Pneumatic Concr. Vibrators
Osgood Shovels, Cranes, etc.
Cleveland Rock Drills, Pne. Tools
Thurston Detachable Bits
Vulcan Pile Hammers, Extractors, Parts
Wiley Concrete Buckets

*Rental Service***H. O. PENN MACHY. CO., INC.**

140th St. & East River Bronx, N. Y.

Representing

CATERPILLAR Tractors SPEEDER Shovels, 1/4-3/4 yd.
LAPLANT-CHOATE MFG. CO. DEERE Indus. Tractors
CO. SMITH Mixers, Pavers
ATHEY TRUSS WHEEL LEROI Compressors, Engines
CO. H E L Y Z E L Steel Bins, Fams
BLAW-KNOX Dirt-Moving Equip.
R. G. L'ETOURNEAU, INC. MARLOW Pumps
MARION Shovels, 3/4-2 yds. KIEGLER Buckets

Warehouse Stock—Service Station

Member: Associated Equipment Distributors

JOHN REINER & CO., Inc.

29 Howard St. New York, N. Y.

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NOVO ENGINE CO.—Gasoline Engines
WISCONSIN MOTOR CORP.—Gasoline Engines and Power Units
PERFEX RADIATOR CO.—Radiators
STOVER MFG. & ENGINE CO.—Diesel Engines, Generating Sets
TWIN DISC CLUTCH CO.—Clutches

Telephone CAnal 6-0286

UNITED HOISTING CO., INC.

165 Locust Avenue NEW YORK, N. Y.

Representing

Sullivan Machinery Co.
Construction Machinery Co.
White Mfg. Co.

Member: Associated Equipment Distributors

N. P. WALTON, JR.

39 Cortlandt Street New York, N. Y.

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JAEGER MACH. CO.—Truck Mixers, Finishing Machines, Road Forms, Spreaders
D. C. ELPHINSTONE, INC.—"BEST" Stone and Chip Spreaders
ERIE STEEL CONSTRUCTION CO.—All-Steel Bins, Complete Aggrometer Plants, Erie Buckets, Clamshell, Dragline and Electric
IOWA MFG. CO.—"CEDAR RAPIDS" Crushers, Material Handl. Equip.; Sand, Gravel and Asphalt Plants
THE KRON CO.—Full-capacity Springless Dial Scales
HANDY SACK BALER CO.—Cement Sack Cleaners, Balers

BREWSTER & WILLIAMS, INC.Contractors' Supplies and Equipment
306 S. Salina St. Syracuse, N. Y.*Representing*

AMERICAN HOIST Shovels, Cranes, Derricks, Hoists
BUTLER Bins and Measuring Hoppers
C. H. & E. Contractors' Pumps, Hoists, Saw Rigs
HAISS Loaders, Excavators, Conveyors and Buckets
HOTCHKISS Steel Forms
LITTLEFORD Asphalt Heaters and Tools
ROGERS Trailers
SULLIVAN Compressors, Drills and Hoists
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Clyde Sales Co.
Goodyear Tire & Rubber Co.
German-Rupp Co.
Goulds Pumps, Inc.
Hazard Wire Rope Co.
Ingersoll-Rand Co.
John-Manville (Bridge Plank)
Killester Mfg. Co.
Koching Co.
LaPlant-Choate Mfg. Co.
Insley Mfg. Co.
Parsons Co.
Rumsey Pump Co.
Universal Farm Clamps Co.
Wickwire Sprocket Steel Corp.
Williamsport Wire Rope Co.
Tinkon Roller Bearing Co.
Tinkon Bits & Rods
Iowa Mfg. Co.
R. G. L'etourneau, Inc.

Member: Associated Equipment Distributors

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P.O. Drawer 426, 3116 Hillsboro St. RALEIGH, NORTH CAROLINA

Br. Off. & Warehouse—No. 1 London Road Phone 411, Asheville, N. Car.

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Aeroli Buyer Company
Buckeye Tractor Ditcher Company
Cleveland Rock Drill Co.
Continental Roll & Steel Foundry Co.
Day Pulverizer Company
Euclid Road Machy. Co.
The Four Ws. Dr. Auto Co.
Galton Iron Wks. & Mfg. Co.
Galton Allsteel Body Co.
Good Roads Mach. Corp.
Hvass Sales Corp.
Iowa Manufacturing Co.
Internat'l Harvester Co.

Member: Associated Equipment Distributors

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ETWYRE—Bituminous Distributors, Flumbers
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BLAW-KNOX—Steel Forms, Bins, Buckets, Truckmixers
BARBER-GREENE—Conveyors, Car Unloaders
DIAMOND—Roll, Jaw Crushers
HERCULES—Gas Road Rollers
LAPLANT-CHOATE—Wagons, Bulldozers
BLISSER-MARLEAN—Wheeled, Rippers, Fresno
THEW—Shovels, Cranes
WONDER—Mixers, Pumps, Hoists
GARDNER-DENVER—Air Compressors, Drills
LACROSSE—Trailers
L'ETOURNEAU—Carry-All Scrapers

Member: Associated Equipment Distributors

THE BLAISDELL-FOLZ EQUIP. CO.

2143-2147 Barnard St. Cincinnati, Ohio

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Allis-Chalmers Mfg. Co.—Tractors, Road Machinery
Chain Belt Co.—Box Pavers, Moto-Mixers, Building Mixers and Pumps
Northwest Engineering Co.—Gasoline Shovels, Cranes, Draglines, Pull Shovels
Ingersoll-Rand Co.—Compressors, Pneumatic Tools, Pumps
Clyde Sales Co.—Hoisting Engines, Derricks
Draw-Doyle Co.—American Tubular Towers
Sauerman Bros., Inc.—Cableways, Power Scrapers, Elevators
Universal Crusher Co.—Crushers
The C. & Johnson Co.—Bins, Batches
Deister Machine Co.—Plat-O Vibrator Screens
Vulcan Iron Works—Pile Hammers
Wolman Engineering Co.—Clamshell, Dragline Buckets
Sageen Derrick Co.—Derricks

Member: Associated Equipment Distributors

THE CLETRAC OHIO SALES CO.

E. 193rd Street and Euclid Ave. Cleveland Ohio

Representing

THE CLEVELAND TRACTOR CO.—Crawler Tractors
THE DAVEY COMPRESSOR CO.—Air-Cooled Compressors
THE EUCUID ROAD MACHY. CO.—Crawler Wagons, Scrapers
MAIN STEEL PRODUCTS CO.—Snow Plows
D-A LUBRICANT CO.—Oil
THE ROC COMPANY—Winches

LOOK THIS DIRECTORY OVER CAREFULLY

If you find any errors while checking over this directory will you please advise us, because it is our desire to keep it accurate and up to date at all times.

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470 Fourth Avenue New York

HOWARD-COOPER CORPORATION

Portland — Seattle — Spokane — Twin Falls

Representing

Internat'l Harvester Co. (McCormick-Deering Industrial Tractors)
Barber-Greene Co.
Cleveland Rock Drill Co.
Marion Steam Shovel Co.
Hughes-Kennan Co.
Cleaver-Brooks Co.
The Jaeger Machine Co.
Nordberg Mfg. Co. (Synonym Crushers)
McKernan-Terry Corp.
Rotary Snow Plow Co.
Schramm, Inc. (Compressors)
Universal Power Shovel Co.
Buda Co. (Diesel & Gas. Eng.)
Baker Mfg. Co.
Walter Motor Truck Co.
Seagrave Corp.
B. F. Goodrich Rubber Co. (Fire Hose)
Waisaw (Scales)
Hercules Company
Sterling Wheelbarrow Co.
Root Spring Scraper Co.
White Mfg. Co.
Erie Steel Cast. Co.
White Mfg. Co.
Wheeler Roller Corp.
J. D. Adams Co.

Member: Associated Equipment Distributors

ALLEGHENY EQUIPMENT CORPORATION

P. O. Box 1888 Pittsburgh, Pa.

Distributors for

ALLIS-CHALMERS Tractors and Allied Tractor Equipment
GARDNER-DENVER Compressors and Drills
HERCULES Road Rollers
HOUGH "Universal" Road Sweepers
JACKSON Concrete Placement Vibrators
LINK-BELT Power Shovels and Cranes
MICHIGAN ¾-yd. Truck and Crawler Shovels and Cranes

WESTERN MATERIAL CO.

Aberdeen, Sioux Falls, Rapid City, S. D.

Anthony Digging Loaders, tools
Halderson Snow Plows
Barber-Greene Ditchers, Loaders
Bates Wire Ties
Bueyru-Erie "Loadmaster" Joint
Butler Bins, Hoppers
Phillip Carey Expansion Joints
"Caterpillar" Equipment
Chain Belt Pump, Mixers
Clyde Sales Hoists
D-A Lubricants
Davey Compressors
Day Crushers
Harris "Russell" Road Equip.
Heater Fireline Pliers
LaPlant-Chaste Tractor Equip.
LeTourneau Dirt-moving Equip.
Littleford Heating Equip.
Manhattan Belting
Pioneer Crushing Plants
Slosser-McLean Scrapers, Fresnoes
Stolle Stone Spreaders
Terra Movers
Walter Motor Trucks
Wausau Snow Plows
Williams-Hyster Winches, Hydrants

Member: Associated Equipment Distributors

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900 East Cary St. Richmond, Va.

Representing

Austin Machinery Corp.
Butler Bin Company
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Chicago Automatic Conveyor Co.
DeWalt Products Corp.
Jackson Mfg. Co.
Sauerman Brothers, Inc.
Chicago Pneumatic Tool Co.
Stephens-Adams Mfg. Co.
Rogers Brothers Corp.
General Excavator Co.
Acroil Burner Co.
Manitowoc Engineering Works
Broderick & Bascom Rope Co.
Chain Belt Company
Van Dorn Electric Tool Co.
Also many other lines of Contractors' Equipment
Member: Associated Equipment Distributors

PACIFIC HOIST & DERRICK CO.

Machinery and Equipment

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Representing

NORTHWEST—Gas and Electric Shovels, Cranes and Draglines
BUHL—Air Compressors
TWIN DISC—Clutches for all purposes
PAGE—Scraper Buckets, Diesel Draglines
MINNEAPOLIS—"Twin City" Gas Engines
CLIMAX—Gasoline Engines
WISCONSIN—Gasoline Engines
MARMON-HERRINGTON—Trucks
DAKE ENGINE CO.
PIONEER—Gravel Equipment
ISAACSON IRON WORKS—Buckets
CLETRAC—Tractors
Member: Associated Equipment Distributors

H. B. FULLER EQUIP. CO.

1836 Euclid Ave. Cleveland, Ohio

Representing

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Link-Belt Co.—Shovels, Cranes, Draglines, Locomotive Cranes
Ransome Concr. Machy. Co.—Pavers, Constr. Mixers, Towers and Chuting Equip.
Baldwin Locomotive Works (Internal Combustion Division)—"Whitcomb" Locomotives—"Gasoline, Diesel, Elec. and Storage Battery Locomotives
Electric Tamping & Equip. Co.—Concrete Vibrators, Elec. Tampers
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Concrete Surfacing Machinery Co.—"Berg" Surfacers
C. H. & E. Mfg. Co.—Pumps, Saw Rigs, Hoists, Mixers, etc.
Groutier Crusher & Pulv. Co.—Hammer Mills, Shredders, Jaw Crushers, Screens, etc.

INDUSTRIAL ENGINE PARTS, INC.

1053 E. 61st St. Cleveland, Ohio

Representing

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Fuller & Johnson Mfg. Co.
Wisconsin Motor Corp. (Air-Cooled)
Stover Engine & Mfg. Co.
Selentilla Magneto Co.
Waco Electric Co. Pierce-Gowman Co.
Portable Power Tool Corp. Hercules-Servel, Inc.
LeRel Co.

W. T. WALSH EQUIPMENT CO.

3088 West 106th St., Cleveland, Ohio. Tel. Clearwater 4400

Barco Mfg. Co.—Gasoline Pile Drivers
Barnett Company—Crushers
Cleveland Rock Drill Co.—Air Tools
Diamond Iron Works—Crusher Plants
The C. S. Johnston Co. Foote Company—Pavers
General Excavator Co.—Specialties
Hough-Universal—Sweepers
Huber Mfg. Co.—Rollers
White Mfg. Co.—Asphalt Plants, Tar Kettles, Kerosene Torches, Concr. Vibrators
McKernan-Terry Corp.—Pile Drivers
Michigan—Power Shovels
New Engine Co.—Engines, Light Plants, Pumps
R-B Equipment Co.—Fine-graders
Rusco Mfg. Co.—Roco Distributors & Oilers
Schramm, Inc.—Air Compressors
Timken-Bits
Vibor Co., Ltd.—Vibrators
Wellman Engineering Co.—"Williams" Buckets
Allis-Chalmers—Tractors
Construction Machy. Co.—Mixers
Member: Associated Equipment Distributors

J. C. HOUSTON

30 Church Street New York, N.Y.

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HOISTING MACHINERY CO.

Warehouse

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SOUTHERN OHIO EQUIP. CO

169-171 W. Main St., Zanesville, Ohio

On Route 40

Phone 813

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Iowa Mfg. Co. D-A Lubricant Co.
General Excavator Co. Shunk Mfg. Co.
W. A. Riddell Co. Apollo Culvert Works
Schramm, Inc. Slusser-McLean Co.
Cleveland Rock Drill Co. Williamsport Wire Rope Co.

CLYDE EQUIPMENT CO.

Contractors' Equipment and Supplies

Portland, Ore. Seattle, Wash.

Atlas Imperial Diesel Eng. Co.
Blaw-Knox & Western Pipe Corp.
Clyde Iron Works
Humboldt Corp.
Lincoln Electric Co.
Bueyru-Erie Co.
Geo. Hais Mfg. Co., Inc.
Sauerman Brothers
Sullivan Machinery Co.
Klausner Mfg. Company
Y. L. Smith Co.
Allis-Chalmers Mfg. Co.
LeRel Company
Banks Bros.
Kehler Co.
Buffalo-Springfield Roller Co.
Wm. Bros. Boiler & Mfg. Co.
Smith Engineering Works

Member: Associated Equipment Distributors

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Chester Pennsylvania

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OSGOOD Shovels—all types
WEHR CO.—Road Graders, all sizes
TRACKSON CO.—Crawler Wagons, Crawlers
MICHIGAN Power Shovels
SCHRAMM Compressors

LOCOMOTIVES

HOISTS—SCRAPERS—WIRE ROPE
MANGANESE DIPPER TEETH

EDELEN & BOYER COMPANY

Office and Warehouse 238 North 23rd St. Philadelphia, Penna.

Distributors of

Osgood Shovels, Cranes
General Shovels, Cranes
Multi Foote Pavers
Adnan Black Top Pavers
Heltzel Steel Forms, Bins
Heltzel Finishing Mach.
Marsh Capren Mixers
Wunder Concrete Mixers
Marlow Centrifugal Pumps
Marlow Diaphragm Pumps
Chrysler Portable Air Compressors
New Haven Burrlapped-Cotton Blankets
Hayward Clamshell Buckets
Huber Rollers
Archer Towers, Buckets
LaCrosse Tu-way Trailers
Burr Stone Spreaders
Sagen Derricks, etc.
Flory Hoists
R-B Power Subgrader
Miles Black Machines
Pulmonator Steam Pumps
Bay City Truck Cranes
Tru-Lay Steel Cable
Reynolds Constr. Furnaces
Jackson Wheelbarrows, etc.

GILES & RANSOME

17th St. & Sedgley Ave., Philadelphia

ATHEY TRUSS WHEEL CO.—Crawler Wagons
R. G. LeTOURNEAU, INC.—Carryalls, Buggies
RANSOME CONCRETE MACHINERY CO.—Concrete Mixers and Appliances
BLAW-KNOX CO.—Clam-shell Buckets, Steel Forms, Steel Buildings, Steel Bins.
CATERPILLAR TRACTOR CO.—Tractors and Road Machinery
RICHMOND SCREW ANCHOR CO.—Concrete
THE BARNES MFG. CO.—Centrifugal Diaphragm and Force Pumps
NORTHWEST ENGINEERING CO.—Gasoline Cranes and Shovels
ORD—Road Finishing Machine
CLYDE—Hoisting Engines and Derricks
Member: Associated Equipment Distributors

HOWARD W. READ CORP.

800 N. Delaware Ave., Philadelphia, Pa.

Distributors

Koehring Co.
Ingersoll-Rand Co.
Pomona Pump Co.
Gorman-Rupp Co.
Iowa Mfg. Co.
Wm. Bros. Boiler & Mfg. Co.
Galton Iron Works & Mfg. Co.
Metall Forms Co.
Quick-Way Truck Shovel Mfg. Co.

Also Carry in Stock:

Hoisting Engines, Gas and Steam
Pile Driving Hammers
Truck Cranes

SERVICE SUPPLY CORPORATION

20th and Venango Sts., Philadelphia, Pa.

Representing

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Blaw-Knox Co.—Tubular Hoisting Towers
Chain Belt Co.—Mixers, Truck Mixers, Pumpcrete, Pumps, Saw Rigs
Chicago Pneumatic Tool Co.—Compressors, Air Tools
Dravo Doyle Co.—Tubular Hoisting Towers
Inley Mfg. Corp.—Concr. Handling Machy., Excavators
Internat'l Harvester Co.—Indus. Wheeltype and Crawler Tractors
C. S. Johnson & Co.—Bins, Batches, Cement Handl. Eq.
Littleford Bros.—Road Oil Distrib., Heating Kettles, etc.
McKernan-Terry Corp.—Pile Drivers, Hoists
Nelson Iron Works—Loaders and Belt Conveyors
The Parsons Company—Trench Machines, Snow Plows
W. A. Riddell Company—Power Graders
Member: Associated Equipment Distributors

J. JACOB SHANNON & COMPANY

1744—Market Street—1744 PHILADELPHIA

Representing

T. L. Smith Co.—Concr. Truck Mixers, Pavers, Glass Mixers
Allis-Chalmers Mfg. Co.—Tractors, Graders
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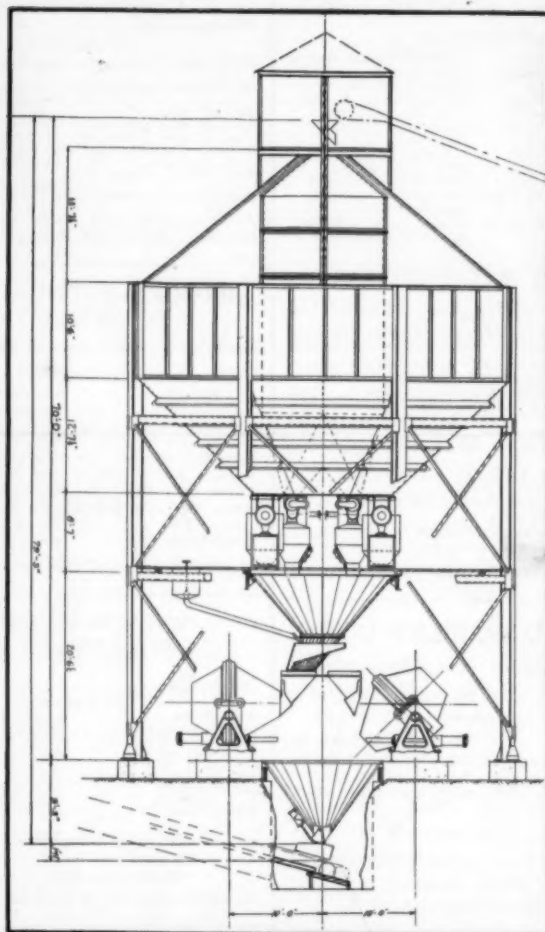


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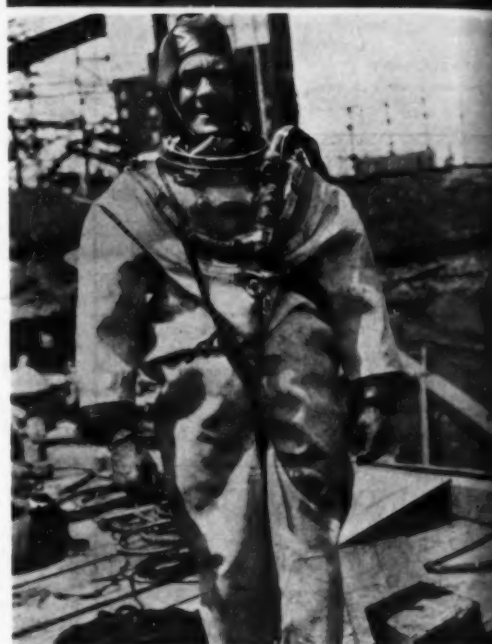
An Indiana State Highway Maintenance Crew Making a Thin Patch with Rock Asphalt. Above, Pouring and Squeegeeing the Cut-Back Seal on the Low Area to Be Patched. Left, Luting the Rock Asphalt, Leaving Coarser Particles at the Center and Carrying the Fines Out to a Feather Edge. Right, the Maintenance Crew's Motor Truck Manipulating the Wheeled Roller Which Gives the Final Compaction to the Patch. See Page 1.



Excavating Operations and the Concreting Trestle at Tygart Reservoir Dam, Grafton, W. Va., for Which Frederick Snare Corp., New York City, Is the General Contractor. See Page 1.



Section of the Fast One-Man-Controlled Batching and Mixing Plant Installed for Producing the 1,200,000 Cubic Yards of Concrete for Tygart Reservoir Dam. This Plant, Is Reputed to Be the Fastest Concrete Plant in the World. See Page 1.



Colin O'Donnell, of the Diving Partnership of Vance and O'Donnell, in His Deep Sea Outfit Except for the Pot or Hat. This Pair of Divers Is Kept Busy at Bonneville. See Page 2.



C. & E. M. Photos

Significant Operations on the Rodgers & Hagerly Contracts, Sections 11 and 12 of the Bronx Intercepting Sewer, Part of the Ward's Island Sewage Treatment Works for New York City. Left, the Mobile Pile Driver Rig Which the Contractor Built on the Job; Center, Timbering and the Header with Wellpoints Tapped on 3-Foot Centers; Right, the Top of the Trench with a Crane and Clamshell Handling the Clay, Muck and Sand Excavation. See Page 13.